

JOURNAL OF THE American Veterinary Medical Association

FORMERLY
AMERICAN VETERINARY REVIEW
(Original Official Organ U. S. Vet. Med. Ass'n)

EDITED AND PUBLISHED FOR
The American Veterinary Medical Association
by W. H. Dalrymple, Baton Rouge, La.

V. A. MOORE, President, Ithaca, N. Y. N. S. MAYO, Secretary, Chicago.
M. JACOB, Treasurer, Knoxville, Tenn.

Executive Board

GEO. HILTON, 1st District; T. E. MUNCE, 2nd District; S. E. BENNETT, 3rd
District; J. R. MOHLER, 4th District; C. H. STANGE, 5th District; R. A.
ARCHIBALD, 6th District; A. T. KINSLEY, Member at Large.

Sub-Committee on Journal

J. R. MOHLER GEO. HILTON R. A. ARCHIBALD

Index Number

CONTENTS

EDITORIAL.....	677
PAPERS, ETC.:	
Preliminary Report on Value of Blood Tests in Control of Contagious Abortion—C. P. FITCH, W. L. BOYD, W. A. BILLINGS.....	681
Suggestions for Legal and Regulatory Measures Against Bovine Infec- tious Abortion—WARD GILTNER.....	702
Discussion on Papers of Drs. Fitch, et al., and Giltner.....	714
Present Status of Specific Treatment for Contagious Abortion—H. PRIN- STON HOSKINS.....	727
Hemorrhagic Septicemia—G. E. JORGENSEN.....	733
The Swine Disease Situation—C. H. STANGE.....	740
Tick Eradication Plans for 1919—JNO. R. MOHLER.....	745
CLINICAL AND CASE REPORTS:	
Economical Tank for Air Treatment of Parturient Paresis—I. D. WILSON.....	749
Some Experiences Obtained from Contact with Tuberculosis—G. E. JOR- GENSEN.....	751
Tetanus in a Cow Following Retained Placenta—E. MORGAN.....	754
ABSTRACTS.....	757
ARMY VETERINARY SERVICE.....	762
ASSOCIATION NEWS:	
American Veterinary Medical Association.....	763
Other Associations.....	763
NECROLOGICAL.....	783
REVIEWS.....	784
MISCELLANEOUS.....	785

THE JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION is issued the first of each month. Manuscripts and copy for insertion should be as nearly perfect as possible for the printer and should be received by the tenth of the preceding month to insure insertion in the next month's issue. Volumes begin in April and October.

Communications relating to publication, subscriptions, advertisements and remittances should be addressed to JOURNAL OF THE AMERICAN VETERINARY MEDICAL ASSOCIATION, Baton Rouge, La. Matters pertaining to the American Veterinary Medical Association and Membership should be sent to Dr. N. S. MAYO, Secretary, 4753 Ravenswood Avenue, Chicago, Ill.

Entered as Second Class Matter, October 26, 1918, at Baton Rouge, La., under Act of March 3, 1879. Acceptance for mailing at special rate of postage provided for in Sec. 1103, Act of October 3, 1917; authorized October 26, 1918.

Equine Cough Syrup

FOR EQUINE, BOVINE AND CANINE DISEASES
OF THE RESPIRATORY TRACT.

Each fluidounce represents:

Spirit Nitrous Ether, 64 minims.
Morphine Acetate, $\frac{1}{4}$ grain.
Chloroform, 4 grains.
White Pine Bark, 32 grains.
Grindelia, 32 grains.
Wild Cherry Bark, 16 grains.

Balsam Poplar Buds, 8 grains.
Sanguinaria, 4 grains.
Eriodictyon, 4 grains.
Sassafras Bark, 4 grains.
Alcohol, 14 per cent.
Eucalyptol and Honey, q. s.

EQUINE COUGH SYRUP is efficacious in the treatment of all inflammations of the air passages in which cough is a notable symptom. Not only does it allay cough, but it checks the progress of the pathologic condition of which cough is the chief symptom.

SOME INDICATIONS.

Influenza, Strangles, etc.

A few doses in the early stages usually abort the cough.

Acute Bronchitis.

Highly serviceable when cough is troublesome and the irritable membrane dry and vascular.

Laryngitis and Pharyngitis.

Particularly useful in the early stages.

Chronic Cough following Influenza.

Give the syrup at regular intervals until the cough subsides.

NET PRICES.

Pint bottles	per dozen, \$9.00
Gallon bottles	per gallon, 5.00
5-gallon bottles	per gallon, 4.60

Dose: Horses and cattle, 1 to 3 ounces;
dogs, 1 to 2 drachms.

LITERATURE ACCOMPANIES EACH PACKAGE.

Home Offices and Laboratories,
Detroit, Michigan.

Parke, Davis & Co.

Co.

JOURNAL
OF THE
American Veterinary Medical Association

FORMERLY AMERICAN VETERINARY REVIEW

(Original Official Organ U. S. Vet. Med. Ass'n)

W. H. DALRYMPLE, Editor.

BATON ROUGE, LA.

V. A. MOORE, President, Ithaca, N. Y. N. S. MAYO, Secretary, Chicago.
M. JACOB, Treasurer, Knoxville, Tenn.

Executive Board

GEO. HILTON, 1st District; T. E. MUNCE, 2nd District; S. E. BENNETT, 3rd
District; J. R. MOHLER, 4th District; C. H. STANGE, 5th District; R. A.
ARCHIBALD, 6th District; A. T. KINSLEY, Member at Large.

Sub-Committee on Journal

J. R. MOHLER

GEO. HILTON

R. A. ARCHIBALD

The American Veterinary Medical Association is not responsible for views
or statements published in the JOURNAL, outside of its own authorized actions.

Reprints should be ordered in advance. A circular of prices will be sent
upon application.

VOL. LIV., N. S., VOL. 7.

MARCH, 1919.

No. 7

VIGILANCE BUT NOT ALARM.

Within the past six months two outbreaks of foot-and-mouth disease have occurred in England, this time in the County of York, which was confirmed on January 10, notification having at once been sent by the British authorities to the Bureau of Animal Industry at Washington. The Bureau was also informed that the British veterinary authorities had the infected area under quarantine, and that the outbreak was under control, which is very gratifying news indeed. However, the Bureau has cancelled all permits for the importation of cattle, sheep and swine from that country, and is taking special precautions for the inspection and quarantine of such animals now enroute to the United States. There is every need of vigilance concerning the matter, but not necessarily of alarm, although, on account of the constant communication between the two countries, it is extremely important that veterinarians and stockowners all over the country should keep a sharp lookout for any condition that might appear suspicious in those animals that are especially susceptible to the disease.

We understand that the Canadian officials have also been notified of this latest outbreak in England. Let us hope that the British veterinary officials may be able to eradicate the present

local infection and prevent its getting further, which we have every reason to hope they will.

VETERINARY EDUCATION AND THE WAR.

From data published by the Office of Information, U. S. Department of Agriculture, it would appear that in the twenty-one veterinary colleges in this country accredited by the Bureau of Animal Industry, the attendance diminished very materially last year, the dean of one of the colleges reporting that, owing to war enlistments, he had lost 50 per cent of the faculty and 66 per cent of the students. The number of freshmen enrolled in all veterinary colleges of the country for the 1917-1918 session was 338, against 637 for the preceding year, a decline of about one-half. The total attendance at all veterinary colleges showed a falling off of more than 800 students, with a further reduction indicated for the session of 1918-1919.

As interpreted by the Bureau of Animal Industry, the effects of the reduced attendance in veterinary institutions will be felt more in the future than at present, for the coming graduating classes will be unusually small.

In view of these facts, it is urged by the Bureau that, until veterinary education and the profession generally can be restored to at least its pre-war development, live stock raisers use extreme care in safeguarding the health of their animals, and should report promptly to state and federal authorities all suspected cases of contagious disease. They should remember, also, that sanitation and other preventive measures will assist greatly in reducing animal ailments. Attention is further drawn to the necessity to encourage persons of proper fitness to engage in veterinary studies, so that there may be an adequate number of trained men to respond to emergency calls, and for prompt control of epizootics. As the Bureau suggests, the effects of the war on the profession will be felt more in the future than at present, owing to the shortage of matriculants at the colleges, and this condition will probably affect sanitary control work more than any other branch. Hence the importance, until the shortage of graduates is made up, of stockowners themselves safeguarding the health of their animals, and of reporting suspicious cases of disease to the proper authorities. The suggestion, also, to encourage, as much as possible, eligible and fit young men to take up the study of veterinary science, not only for their own sakes, but

for the benefit of the live stock interests of the country, is a good one, and quite timely.

THE ERADICATION OF TUBERCULOSIS.

When the question of tick eradication in the South was first presented to Congress in order to obtain an appropriation from the Federal Government wherewith to make a start, there were many "doubting Thomases" as to the feasibility—in fact, possibility—of ridding the Southern States of their cattle ticks. This opinion was held, not only by the country folks who were living amongst those parasites, but by the more intelligent classes, but who were not, of course, familiar with the subject. The Southern cattle owner said, "It just can't be done; why, the woods are full of them and they are all over every little animal that runs around." If this had been absolutely so, the undertaking would, indeed, have been a more serious one. However, our farmer friends were not then aware that, while there are quite a number of different varieties of ticks, each preying upon its own particular host, the only one which was a carrier of the protozoan of tick fever was the common cattle tick, which developed only on horses, mules and cattle, and to get rid of it meant the elimination of Texas (or tick) fever, which has been the bane of the Southern cattle owner, and has held the South back, agriculturally, more than any other single factor. Today, after twelve years, or so, of persistent effort, the problem of tick-freedom has been almost solved. It has taken time and an abundance of patience, which the accomplishment of big things invariably requires.

But while the work of tick eradication affected one section of the country only, the eradication of tuberculosis is a country-wide undertaking, and will require the best that is in the veterinary profession, both individual, state and national, to accomplish final results within a reasonable space of time. Still, the example set by the work of tick eradication, with its many obstacles to overcome, should be a good object lesson, as well as a stimulus, to those engaged in the work which will have to cover a much greater area of country; and when it has been accomplished, what a splendid boost it will have been to the veterinary profession, and a most exceptional opportunity for the profession to have raised itself in the estimation of the public, and gained greater public confidence.

According to information published in the *Weekly News Letter* of the U. S. Department of Agriculture, very satisfactory progress has been made during the first year of the work, and prospects for the future are bright. During the year 296 herds, comprising 9,284 cattle, have been fully "accredited" as free from tuberculosis, and 1,462 herds, having 35,052 cattle, passed one successful test in preparation for certification. In addition, 4,622 herds, both pure-bred and grade, totaling 98,002 animals, have been under supervision for the eradication of tuberculosis; and each month additional herds are being added to the list. A revision of List No. 1 of accredited herds is promised in the near future, when it will be widely distributed.

The work, as we have said, is countrywide, and from a printed table in the *News Letter*, is already being pursued in practically every state in the union. It is a great work from many standpoints. It is so, from the standpoint of humanity; from an economic point of view; and is, or ought to be, from the viewpoint of the veterinary profession, if it will only take full advantage of the exceptional opportunity.

Dr. A. C. Goebel of Congers, New York, has become assistant to Dr. Robert S. McKellar of New York City. Dr. Goebel was trained at Camp Greenleaf, released from service, entered the B. A. I., and now goes into general practice. Larger compensation for Bureau veterinarians must be offered and assured.

Captain Charles S. Chase, recently stationed at Deming, New Mexico, one of the teaching staff of the New York State Veterinary College, New York City, has resumed practice at Bay Shore, Long Island, and instruction at the college.

Lieutenant Joseph P. Mack of Tappan, New York, has been released from the Army Veterinary Service at Camp Apache, Arizona, and has returned to New York.

Lieutenant David McAuslin of Brooklyn has resumed practice after many months of service in the Army Veterinary Corps at Camp Dix, Newport News, and Hoboken. The Lieutenant has been placed in the Reserve Veterinary Corps. His experience in transport service prior to entering our own war service made him a valuable addition in remount and transportation service.

Dr. E. M. Wiggs of Greenville, Texas, has been appointed State Veterinarian of the Lone Star State.

PRELIMINARY REPORT ON THE VALUE OF THE BLOOD TESTS IN THE CONTROL OF CON- TAGIOUS ABORTION.*

C. P. FITCH, W. L. BOYD, W. A. BILLINGS.
University Farm, St. Paul, Minn.

(Published with the approval of the Director as Paper No. 131 of the Journal Series of the Minnesota Agricultural Experiment Station.)

Since Widal in 1896 used the agglutination test in the diagnosis of typhoid fever much work has been done to apply the principle thereby demonstrated to the diagnosis of other diseases. M'Fadyean at about this time showed its value in the diagnosis of glanders. Schütz and Miessner and also Schnurer verified the work of M'Fadyean and clearly showed the value of the agglutination test in the control of this disease of horses.

In a like manner following the demonstration of complement fixation in the diagnosis of syphilis by Wasserman in 1906 this test has been widely used. It is of particular value in the early recognition of glanders and dourine of horses.

The application of these blood tests in the diagnosis of contagious abortion of cattle was demonstrated at about the same time (1909) by M'Fadyean of England and Holth and Wall of Denmark. Since then many workers have published accounts of the use of agglutination and complement fixation in the recognition of abortion disease. Among these should be mentioned Brüll, Grinsted, Larsen, Surface, Mehler and Traum and very lately Rettger and Davis.

The precipitation test was used by Szymanowski for diagnosing infectious abortion. The results obtained by this method, however, were unsatisfactory and so far as known this test has been used very little.

We have been working with the blood tests since 1912. Many things have come up in connection with them that have made us doubt their present value in the control of this disease. The results actually reported in this paper are only those which serve to illustrate the points in question.

In another publication in 1913, one of us in conjunction with Moore pointed out the difficulties which are encountered in the use of the complement fixation test in this disease. There is

* Presented at 55th Annual Meeting A. V. M. A., Philadelphia, 1918.

present in all blood serum from cattle a substance which has been called "colloide de boif" and was afterwards designated "conglutinine." This substance in conjunction with complement will produce agglutination and hemolysis of the washed red blood corpuscles of sheep. This phenomenon is the basis of the conglutination test which has been critically studied. This latter test is founded on the discovery of Ehrlich and Sacks, who combined in a test tube the fresh blood serum of a horse, the inactive (heated to 56°C for one-half hour) blood serum of a cow and the washed red corpuscles of a guinea pig. An agglutination of the red corpuscles and hemolysis occurred. This phenomenon was further studied by Bordet and Gay. The blood serum of all cattle contains a thermostable body which hemolyzes the red blood corpuscles of sheep. It is, of course, upon this reaction (hemolysis) that the complement fixation test depends and on account of the natural hemolysins which exist in all cattle blood serum, the results of complement fixation are thereby affected. It is true that the amount of cattle serum used in the complement fixation test for infectious abortion is small and thereby the hemolyzing action slight; nevertheless, in our study of the conglutination test we found that the amount of "conglutinine" contained in the sera of cattle varied in a wide degree and sometimes even the small amount of serum used in the fixation test was sufficient to cause hemolysis. This factor renders the results obtained by complement fixation open to question in certain cases where conglutinine is present in considerable amount.

Thomsen, working in Jensen's laboratory, where Holth and Wall did their work, found that if the serum of animals is inactivated (heated at 56°C for 30 minutes) the results are unreliable. That is, in the sera tests for contagious abortion in cattle, the inactivation of the serum for the complement fixation test is not only unnecessary but probably injurious. Nearly all the tests by this method so far reported have been done with inactivated serum.

Surface in this country found that the bacteriolytic amboceptor for infectious abortion existed in the blood of twenty-nine out of forty-three guinea pigs killed for complement and further he shows that an excess of cow's serum has an inhibiting effect on the hemolysis. In other words, Surface demonstrated that by varying the amount of the serum of the animal tested he could obtain strong positive reactions using 0.8 c.c. of serum. If he decreased this amount, for example, to 0.08 c.c. the reaction was

negative. But if the amount of serum was further decreased to 0.0008 c.c. the reaction again became strongly positive. The inhibiting effect of excess cow serum varied in a marked degree in the nine animals tested.

During 1914-15 one of us carried out a large number of blood tests for abortion disease, duplicate samples of which were sent to the Bureau of Animal Industry at Washington, D. C. (These are reported by Williams). Here both agglutination and fixation were carried out. In nearly all instances the agglutination tests at both laboratories agreed. In some instances, however, the results of the complement fixation test did not agree with those obtained by the agglutination method. As a general rule, however, the results of both tests were similar. Rettger and Davis state that in their work that the "results obtained by these two methods have been most gratifying." It is significant to note, however, that the same authors state further that, "Agreement between the results of the two tests was earnestly sought and no test was pronounced positive or negative unless the reactions were in perfect accord." They fail to state, however, in just what cases the results obtained by the two methods varied, but it seems as if it were safe to assume that in these results there were some variations.

Taking into consideration, first, that three factors (conglutinine, inactivation and inhibition) may influence the results of the complement fixation test; second, the complexity of the technic of the test; and, third, that the results of this test in the majority of cases agree with those obtained by the agglutination method, we do not believe that the complement fixation test has any advantage over the agglutination test in diagnosing contagious abortion. Mohler and Traum state that in their experience "Only in doubtful cases would it be necessary to refer to the more complex complement fixation test." These latter cases are very few in number and we question even in these whether the complement fixation test would aid in the diagnosis.

Seddon in 1915 pointed out several very important factors in connection with the agglutination test for abortion. Among other things he states that the amount of serum used is the dominating factor and not the degree of dilution in which it is employed. This same fact has been noted by other investigators, especially from continental Europe. In reporting the results of this study we are giving both the dilution and the amount of serum used.

The method used in reporting this work is one that has been followed since 1910, when reporting the results of the agglutination test for glanders. The amounts of serum employed or dilutions have been selected only after much experimentation to determine just which amounts gave the most knowledge concerning the presence or absence of the agglutinating antibodies. The abbreviation "SL" (slight) is used to indicate a partial reaction which does not show perfect clearing, but does show some sedimentation. The signs + and — are used to indicate a complete and a negative (no agglutination) reaction respectively. Hadley has recently proposed a uniform system for reporting the results of the agglutination test. While recognizing the need of such a system, we have not adopted it in this work, as some of the results were obtained before the publication of this article by Hadley.

Another factor which influences the results of the agglutination test is the concentration and amount of the bacterial suspension employed as test fluid. Seddon in his work used 0.5 c.c. of what he calls "Standard X" emulsion. This is chosen because (1) it gives a marked naked eye deposit (and hence is easily read) in a positive reaction; (2) conversely it gives a definitely cloudy appearance (and hence easily read) in a tube where there is no agglutination; (3) it is the minimum amount of emulsion that will answer the above requirements. If the test fluid is too heavy (concentrated) in a positive agglutination a deposit will form on the bottom of test tube, but the fluid still remains cloudy. It is very important that as nearly as possible a uniform suspension be employed and we believe that this is best secured by comparison to a standard suspension of barium sulphate, the idea evolved in connection with the Nephelometer. This method is crude, but it seems to be sufficiently accurate to give uniform results.

The results obtained in testing a sample of blood are oftentimes confusing to interpret. For example, in working with sera from certain animals an agglutination will be observed in those tubes which contain 0.05 c.c. and 0.02 c.c. of serum (dilutions of 1-20 and 1-50), no agglutination in the tubes having 0.01 c.c. and 0.005 c.c. (dilutions of 1-100 and 1-200) and again perfect agglutination in the tubes containing 0.002 c.c. and 0.001 c.c. (dilutions of 1-500 and 1-1000). We have always referred to these as "paradoxical reactions" and in the early part of our work these very confusing phenomenon were not infrequently observed. Seddon also noted this same thing and refers to it as

"a peculiarity of agglutination." Hewlett mentions it in connection with *Mic. melitensis* (according to Evans, this organism should be called *Bact. melitensis*). No explanation was offered by Seddon for this phenomenon, nor are we able to make one. We do know, however, that the number of these very confusing tests has been greatly reduced by employing less test fluid and using smaller amounts of serum in higher concentration. In the beginning of this work we employed 3 c.c. of test fluid and added the requisite amounts of serum from a basic dilution of 1-40. This was essentially the technic used in the agglutination test for glanders. The results of the agglutination test here reported were obtained by using 1 c.c. of test fluid and adding for the first three tubes undiluted serum and for the last three tubes from a basic dilution of the serum of 1-20. Using this technic, we have reduced the number of so-called "paradoxical" reactions to the minimum. It is rather significant to note that Rettger and Davis employed in their work only two dilutions, 1-50 and 1-100, and that they used 3 c.c. of test fluid. It is possible that if a higher dilution had been set that a reaction in a dilution higher than 1-100 might have been obtained, even though no agglutination was noted at 1-100.

The results here reported come from representative herds in the Northwest. Most of these are made up entirely of pure-bred animals with the exception of Herds E and F. Nearly all the animals in these herds are grades. We have endeavored in each case to secure just as accurate breeding history as possible, taking into consideration not only the act of abortion but retained placenta and sterility as well. It has been recognized for some time that the birth of an immature fetus was but one of the conditions signifying the presence of this symptom complex called "contagious abortion." Too many people still cling to the idea that abortions must occur in large numbers in a herd before the contagiousness of the disease is recognized and proper measures taken to suppress it.

Many animals abort in the early stages of pregnancy and pass unnoticed. The animals miss one or more oestral periods and then appear in heat again. A negative history of abortion, especially in herds which are badly affected, must be considered with some doubt, providing these animals have been served several times at irregular intervals.

Metritis, salpingitis and cystic ovaries of cattle are often considered to be due primarily to an infection with *Bact. abortus*,

Bang. These conditions, as well as retained placenta, ought to be taken into consideration when judging whether an animal is infected with abortion disease. We have had some cases, however, that lead us to believe that other organisms besides *Bact. abortus* may be responsible for secondary infections and do even more harm than the abortion germ itself. To illustrate this, a single case will be cited. Cow No. 89, Herd H, calved at full time. The uterine contractions were weak and traction was necessary to aid in the expulsion of the fetus. The calf, a heifer, was very weak and covered with the so-called "abortion exudate." Cultures carefully made from this material and from the amniotic fluid, after several days' incubation, gave pure growths of a micrococcus. The placenta was retained and had to be removed. The calf lived. It will be noticed from the tables that the agglutination test showed that the dam reacted with 0.001 c.c. (1-1000) and the calf with 0.01 c.c. (1-100). This would indicate that the mother had been infected with *Bact. abortus*. From the cultures, however, it would seem as if the micrococcus was responsible for the retained placenta and uterine inertia. It is possible that this secondary invasion is responsible for some of the disasters of abortion disease and would also explain some of the apparent discrepancies reported in the tables. In certain other analogous cases, also, the colon organism and rarely a streptococcus has been isolated when the primary cause was undoubtedly *Bact. abortus*. We are not prepared as yet to state just what importance this secondary infection may play in abortion diseases, but are continuing our studies.

HERD A.

Blood drawn June 10, 1918.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05 1-20	0.02 1-50	0.01 1-100	0.005 1-200	0.002 1-500	0.001 1-1000
1	10 yrs. Never aborted. Calved regularly. Had R. P. One heifer killed because sterile	+	+	+	—	—	—
2	3 yrs. Dam is No. 1. First calf born dead at full time. Second calf aborted 6 mo. June 29, '18.....	+	+	+	SL	—	—
3	6 mos. Bull calf. Dam is No. 1.....	—	—	—	—	—	—
4	5 yrs. Never aborted. Living calf November, '18	+	+	SL	—	—	—
5	4 yrs. Had three calves. Last one dead but at full term.....	+	+	+	+	+	+
6	11 yrs. Never aborted.....	+	+	—	—	—	—
7	4 mos. Bull calf. Dam is No. 6.....	+	—	—	—	—	—
8	6½ yrs. Never aborted. Had bull calves	+	+	+	—	—	—
9	5 mos. Bull calf. Dam is No. 8.....	—	—	—	—	—	—
10	10 yrs. Never aborted. Had 6 calves.	—	—	—	—	—	—
11	2 mos. Heifer calf. Dam is No. 10..	—	—	—	—	—	—
12	14 mos. Heifer. Not bred. Dam is No. 10	+	SL	—	—	—	—
13	12 yrs. Never aborted.....	+	+	+	—	—	—
14	6 yrs. Never aborted.....	+	+	+	+	+	SL
15	9 yrs. Never aborted. Calved regularly	+	+	+	—	—	—
16	5 mos. Bull calf. Dam is No. 15....	—	—	—	—	—	—
17	6 yrs. Under treatment for sterility. A new animal in the herd.....	+	+	SL	—	—	—
18	3 yrs. Had two calves. Now in calf..	+	+	+	—	—	—
19	1 yr. Heifer. Not bred. Dam is No. 18.	+	+	—	—	—	—
20	2 mos. Bull calf. Dam is No. 18.....	+	—	—	—	—	—
21	9 yrs. Calved regularly.....	+	+	+	+	SL	SL
22	3 yrs. Had one calf. Now in calf.....	+	+	+	SL	—	—
23	1 yr. Heifer. Not bred.....	+	+	SL	SL	—	—
24	1 yr. Bull. Never used for service....	+	—	—	—	—	—
25	2 mos. Heifer calf.....	—	—	—	—	—	—
26	5 yrs. Herd bull.....	+	+	+	SL	—	—
27	4 yrs. Bull. Sire of aborted calf of No. 2	+	—	—	—	—	—
28	8 mos. Heifer calf. Dam aborted her first calf	SL	SL	SL	—	—	—

HERD B.

Blood drawn June 20, 1918.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	8 yrs. Always calved normally. Last Dec. 20, '17.....	+	SL	SL	—	—	—
2	6 mos. Heifer calf. Dam is No. 1.....	+	+	—	—	—	—
3	8 yrs. Imported. Never aborted. Calved Aug., '17. Now in calf.....	+	+	—	—	—	—
4	10 mos. Heifer. Dam is No. 3.....	+	+	+	+	—	—
5	3 yrs. Had two calves. Not bred. Never aborted.....	+	+	+	+	+	+
6	3 mos. Heifer calf. Dam is No. 5.....	SL	—	—	—	+	—
7	8 yrs. Never aborted. Calved January 10, '18.....	+	+	—	—	—	—
8	5 mos. Bull calf. Dam is No. 7.....	SL	SL	SL	SL	SL	SL
9	3 yrs. R. P. with first. Due to calve in October. Dam is No. 7.....	+	+	SL	—	—	—
10	8 yrs. Never aborted. Calved in Mar.....	+	+	+	+	—	—
11	3 mos. Heifer calf. Dam is No. 10.....	+	+	+	+	—	—
12	6 yrs. Never aborted. R. P. with twins in April.....	+	+	+	+	+	+
13	3 mos. Bull calf, twin. Dam is No. 12.....	—	—	—	—	—	—
14	3 mos. Heifer calf, twin. Dam is No. 12.....	—	—	—	—	—	—
15	13 mos. Heifer. Not bred. Dam is No. 12.....	+	+	+	—	—	—
16	4 yrs. Calved in March, '18. Seven months calf in '17.....	+	+	+	+	SL	—
17	1½ yrs. Heifer. Dam is No. 16.....	+	—	—	—	—	—
18	3 mos. Bull calf. Dam is No. 16.....	—	—	—	—	—	—
19	6 yrs. Never aborted. Difficult to get with calf. Calved in Feb., '18.....	+	+	—	—	—	—
20	4 mos. Heifer calf. Dam is No. 19.....	+	SL	—	—	—	—
21	5 yrs. Three normal calves. Now in calf.....	+	+	+	+	+	+
22	6 mos. Heifer calf. Dam is No. 21.....	—	—	—	—	—	—
23	3½ yrs. Never aborted. Calved in April, '18.....	+	+	SL	—	—	—
24	2 mos. Heifer calf. Dam is No. 23.....	—	—	—	—	—	—
25	1½ yrs. Heifer. Not bred. Dam is No. 23.....	+	+	+	—	—	—
26	8 yrs. Aborted in '15, '16 and '17.....	+	+	+	+	+	+
27	2 yrs. Calved in Feb., '18.....	+	+	+	+	—	—
28	4 mos. Bull calf. Dam is No. 27.....	SL	—	—	—	—	—
29	1 mo. Bull calf.....	SL	SL	—	—	—	—
30	14 mos. Heifer. Same dam as No. 29.....	SL	—	—	—	—	—
31	2 yrs. Heifer. Due to calve Aug., '18.....	+	—	—	—	—	—
32	2½ yrs. Calved Oct., '17.....	+	+	—	—	—	—
33	4 yrs. Calved June, '18. No abortions.....	+	+	+	+	+	+
34	6 yrs. Calved Oct., '17. No abortions.....	+	+	+	+	+	+
35	6 yrs. Calved Oct., '17. No abortions.....	+	SL	—	—	—	—
36	1 yr. Heifer. Not bred.....	SL	—	—	—	—	—
37	4 yrs. Herd bull.....	+	+	+	+	+	—
38	1 yr. Heifer.....	+	+	—	—	—	—
39	9 yrs. Aborted May, '18.....	+	SL	SL	—	—	—

HERD C.

Blood drawn December 30, 1917.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	12 yrs. Never aborted. Nine live calves	+	SL	SL	—	—	—
2	10 yrs. Never aborted. Dam is No. 1.	—	—	—	—	—	—
3	8 yrs. Never aborted. Dam is No. 1.	—	—	—	—	—	—
4	5 yrs. Never aborted. Now in calf. Dam is No. 1.	+	+	+	+	+	+
5	3½ yrs. Never aborted. Dam is No. 1	+	—	—	—	—	—
6	6 yrs. Never aborted. Dam is No. 1.	+	—	—	—	—	—
7	1½ yrs. Bull. Used for service.	—	—	—	—	—	—
8	5 yrs. Never aborted. Dam is No. 2.	—	—	—	—	—	—
9	7 yrs. Aborted 1913. Live calves ever since	—	—	—	—	—	—
10	8 yrs. Never aborted. Breeds poorly.	—	—	—	—	—	—
11	4 yrs. Never aborted. Breeds poorly.	+	+	+	+	+	+
12	2 yrs. Not bred. Dam is No. 11.	—	—	—	—	—	—
13	6 yrs. Never aborted.	+	+	SL	SL	—	—
14	3 yrs. One normal calf.	+	—	—	—	—	—
15	3½ yrs. Never aborted.	+	—	—	—	—	—
16	8 yrs. Never aborted.	+	—	—	—	—	—
17	7 yrs. Aborted '15. R. P. Calved normally '16, '17 and '18.	+	+	+	+	+	+
18	4 yrs. Never aborted.	—	—	—	—	—	—
19	10 yrs. Never aborted.	SL	SL	—	—	—	—
20	4 yrs. Never aborted. Dam is No. 19.	+	+	+	+	+	+
21	3 yrs. One normal calf.	+	+	+	+	+	+
22	6 yrs. One normal calf. Never aborted.	—	—	—	—	—	—
23	3 yrs. One calf. Dam is No. 22.	—	—	—	—	—	—
24	7 yrs. Last calf aborted '14. Bred several times. Due to calve now.	—	—	—	—	—	—
25	2 yrs. Now in calf.	SL	—	—	—	—	—
26	2 yrs. Bred several times. Now in calf. Dam is No. 8.	SL	SL	SL	—	—	—
27	2 yrs. Now in calf.	—	—	—	—	—	—
28	4 yrs. Calved '16. Now in calf.	—	—	—	—	—	—
29	6½ yrs. Never aborted.	—	—	—	—	—	—
30	2 yrs. Not bred.	SL	—	—	—	—	—
31	1½ yrs. Not bred.	+	—	—	—	—	—
32	11 mos. Not bred.	SL	—	—	—	—	—
33	9 mos. Not bred.	—	—	—	—	—	—
34	11 mos. Not bred.	—	—	—	—	—	—
35	1 yr. Not bred.	+	+	SL	—	—	—

HERD D.

Blood drawn December 31, 1917.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05 1-20	0.02 1-50	0.01 1-100	0.005 1-200	0.002 1-500	0.001 1-1000
1	4 yrs. Aborted. Live calf '17. Now in calf.	+	+	+	+	—	—
2	8 yrs. Aborted '11. R. P. Four normal calves since. Last calf July, '17.	+	+	+	+	+	+
3	4 yrs. Aborted '15. Calved '17. Now in calf.	+	+	+	+	+	+
4	5 yrs. R. P. Two calves. Never aborted.	—	—	—	—	—	—
5	10 yrs. Aborted '13, '16. Live calf '17. Now in calf.	—	—	—	—	—	—
6	5 yrs. Aborted '14. R. P. Metritis '16. Last calf Oct., '17.	+	—	—	—	—	—
7	9 yrs. Aborted '11, '12, '14. R. P. Calved Feb., '17. Now in calf.	+	+	+	+	—	—
8	5 yrs. Had calves '16, '17. Aborted March, '18.	+	+	+	+	+	+
9	5 yrs. Never aborted. Three live calves. R. P. Now in calf.	—	—	—	—	—	—
10	11 yrs. Probably never aborted. Bred seven times for last pregnancy.	+	—	—	—	—	—
11	7 yrs. Aborted '15. R. P. '17. Now in calf.	+	+	+	—	—	—
12	6 yrs. First calf '14 dead. R. P. Metritis. July '17 last calf.	+	+	+	—	—	—
13	7 yrs. Aborted '13. Calved '15. Bred 14 times. Now in calf.	+	+	+	+	SL	—
14	5½ yrs. Aborted '14. '15. Calved '16, '17. Cystic ovaries.	+	+	+	—	—	—
15	6½ yrs. Never aborted. Five calves.	—	—	—	—	—	—
16	5¾ yrs. Aborted. Now in calf.	+	+	+	—	—	—
17	6 yrs. Aborted '13. Calved '15, '17. Metritis.	+	+	+	+	+	SL
18	6 yrs. Aborted '13. Calved '15, '17. R. P.	+	+	+	+	—	—
19	4 yrs. Aborted '16. Calved at 8 mos., '17.	+	+	+	+	+	—
20	2 yrs. Calved Nov., '17.	+	—	—	—	—	—
21	9 yrs. Aborted '11. Calved '13. Aborted '15 and '18.	+	+	+	+	+	+
22	4¾ yrs. Calved '15 and '17. Now in calf.	+	+	+	+	+	+
23	5 yrs. Calved '14. Aborted '17. Now in calf.	+	+	SL	—	—	—
24	5½ yrs. Never aborted. Last calf in March, '17. Now in calf.	+	+	+	+	+	—
25	5½ yrs. Not aborted. Calved '17, '18.	+	+	+	+	SL	—
26	5½ yrs. Aborted '14. Bred 8 times. Calved '16, '17.	+	+	+	—	—	—
27	5 yrs. Aborted Feb., '17. Calved Dec., '17.	—	—	—	—	—	—
28	6 yrs. Aborted '13. Next calves Nov., '16, and Dec., '17.	+	+	+	+	+	+
29	7 yrs. Positive blood test '12. Five calves. Now in calf.	+	+	—	—	—	—
30	1½ yrs. Heifer. Not bred.	+	+	+	—	—	—
31	1½ yrs. Heifer. Not bred.	+	+	—	—	—	—
32	2 yrs. Heifer. Now in calf.	+	+	—	—	—	—
33	1½ yrs. Heifer. Not bred.	+	+	—	—	—	—
34	2 yrs. Heifer. Now in calf.	SL	SL	—	—	—	—
35	1½ yrs. Heifer. Now in calf.	SL	—	—	—	—	—
36	4 yrs. One calf. Metritis.	+	—	—	—	—	—
37	3½ yrs. Herd bull.	—	+	—	—	—	—
38	2 yrs. Heifer. Now in calf.	+	+	—	—	—	—
39	1½ yrs. Herd bull.	+	+	—	—	—	—
40	2 yrs. Heifer. Not bred.	+	—	—	—	—	—
41	2 yrs. Heifer. Not bred.	—	—	—	—	—	—

HERD E.

Blood drawn July 16, 1918.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	Aged cow. Never aborted. Now with calf. Last calf April, '18.	+	+	—	—	—	—
2	1 yr. Heifer. Dam is No. 1.	+	+	—	—	—	—
3	2 yrs. Heifer. Now with calf. Dam is No. 1.	+	+	+	+	+	+
4	2 mo. Heifer calf. Dam is No. 1.	+	+	—	—	—	—
5	Aged cow. Never aborted. Last calf May, '18.	+	+	+	—	—	—
6	2 mo. Bull calf. Dam is No. 5.	+	—	—	—	—	—
7	Aged cow. Never aborted. Now with calf. Last calf Jan., '18.	+	+	+	—	—	—
8	6 mo. Heifer calf. Dam is No. 7.	+	—	—	—	—	—
9	Aged cow. Aborted June, '12. Now with calf. Last calf Dec., '17.	+	+	+	+	+	SL
10	1½ yrs. Heifer. Dam is No. 9.	+	+	+	+	—	—
11	1½ yrs. Heifer. Now with calf. Dam is No. 9.	+	+	+	+	—	—
12	Aged cow. Never aborted. Now with calf. Last calf Dec., '17.	+	+	+	—	—	—
13	6 mo. Bull calf. Dam is No. 12.	+	—	—	—	—	—
14	7 mo. Bull calf.	SL	—	—	—	—	—
15	Aged cow. Never aborted. Now with calf. Last calf Dec., '17.	+	+	+	+	+	—
16	7 mo. Heifer. Dam is No. 15.	SL	—	—	—	—	—
17	1½ yrs. Heifer. Dam is No. 15.	+	+	+	+	+	—
18	Aged cow. Never aborted. Now with calf. Last calf Dec., '17.	+	+	SL	—	—	—
19	Bull calf. 2 mo. Dam is No. 18.	—	—	—	—	—	—
20	Aged cow. Never aborted. Now with calf. Last calf May, '18.	+	+	+	+	—	—
21	15 mo. Bull calf. Dam is No. 20.	+	+	+	SL	—	—
22	2 mo. Bull calf. Dam is No. 20.	SL	SL	—	—	—	—
23	Aged cow. Never aborted. Last calf June, '18.	+	+	+	—	—	—
24	2 wks. Bull calf. Dam is No. 23.	—	—	—	—	—	—
25	Aged cow. Never aborted. Last calf July, '18.	+	+	+	+	+	+
26	Heifer calf. 2 wks. Dam is No. 25.	+	—	—	—	—	—
27	1 yr. Heifer. Dam is No. 25.	+	SL	—	—	—	—
28	Aged cow. Aborted April, '18. R. P. Last calf Sept., '17.	+	+	+	+	+	+
29	2 yrs. Heifer. Dam is No. 28.	+	+	+	—	—	—
30	2 yrs. Heifer. Not bred.	+	+	+	+	—	—
31	Aged cow. Never aborted. Now with calf. Last calf May, '18.	+	+	+	SL	—	—
32	3 mos. Bull calf. Dam is No. 31.	—	—	—	—	—	—
33	Aged cow. Aborted Jan., '18. Now with calf. Last calf Feb., '17.	+	+	+	+	—	—
34	1½ yrs. Heifer. Dam is No. 33.	+	+	—	—	—	—
35	Aged cow. Never aborted. Now with calf. Last calf May, '18.	+	+	+	+	—	—
36	2 mos. Heifer calf. Dam is No. 35.	+	+	+	+	+	+
37	Steer. 2 yrs.	+	+	+	+	+	+
38	Aged cow. Never aborted. Now with calf. Last calf Feb., '17.	+	+	+	+	+	—
39	1½ yrs. Heifer. Dam is No. 38.	+	—	—	—	—	—
40	Aged cow. Never aborted. Last calf Dec., '17.	+	+	+	+	+	+
41	1½ yrs. Heifer. Dam is No. 40.	—	—	—	—	—	—
42	Aged cow. Never aborted. Last calf July, '18.	+	SL	—	—	—	—
43	15 mos. Heifer. Dam is No. 42.	+	SL	—	—	—	—
44	Aged cow. Never aborted. Now with calf. Last calf Oct., '17.	+	+	+	SL	—	—

HERD E—Continued.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
45	1¾ yrs. Heifer. Dam is No. 44.....	SL	—	—	—	—	—
46	9 mos. Heifer.....	+	+	—	—	—	—
47	Aged cow. Never aborted. Now with calf. Last calf Sept., '17.....	+	SL	—	—	—	—
48	2 yrs., 9 mos. Heifer. Now with calf. Dam is No. 47.....	+	+	+	—	—	—
49	Aged cow. Never aborted. Hard to get with calf.....	+	+	+	+	+	+
50	1½ yrs. Heifer. Now with calf.....	+	+	+	+	—	—
51	3 yrs. Heifer. Now with calf.....	+	+	+	+	+	+
52	3 yrs. Now with calf. Never calved..	+	+	+	+	—	—
53	Aged cow. Now with calf. Last calf Oct., '17.....	+	+	+	+	—	—
54	1½ yrs. Heifer. Dam is No. 53.....	—	—	—	—	—	—
55	2½ yrs. Heifer. Now with calf. Dam is No. 53.....	+	+	+	SL	SL	—
56	Aged cow. Aborted Feb., '18. Now with calf. Last calf May, '17.....	+	+	+	SL	—	—
57	Aged cow. Never aborted. Now with calf. Last calf Jan., '18.....	+	+	+	+	+	+
58	Aged cow. Never aborted. Now with calf. Last calf Sept., '17.....	+	+	+	+	+	+
59	Bull calf. 8 mos.....	+	+	SL	—	—	—
60	Aged cow. Aborted May, '18. R. P. Last calf Aug., '17.....	+	+	+	+	+	+
61	Heifer. 3 yrs. Now with calf.....	+	+	+	+	+	+
62	3 yrs. Aborted May, '18. R. P. Now with calf. Never calved.....	+	+	+	+	+	+
63	Aged cow. Never aborted. Now with calf. Last calf Aug., '17.....	+	+	+	+	+	+
64	Aged cow. Aborted March, '17. R. P. Now with calf. Last calf April, '18.	+	+	+	SL	—	—
65	Aged cow. Never aborted. Now with calf. Last calf Nov., '17.....	+	+	+	—	—	—
66	1½ yrs. Heifer. Dam is No. 65.....	+	+	+	—	—	—
67	4 yrs. Herd bull.....	+	+	—	—	—	—
68	Aged cow. Never aborted. Last calf Oct., '17.....	+	+	—	—	—	—
69	Aged cow. Aborted Oct., '16. and Sept., '17. R. P. Now with calf.....	+	+	+	+	+	+
70	2½ yrs. Heifer. Now with calf.....	+	+	+	—	—	—
71	Aged cow. Never aborted. Last calf April, '18.....	+	+	+	SL	—	—
72	Aged cow. Never aborted. Now with calf. Last calf June, '17.....	+	+	+	—	—	—
73	Aged cow. Never aborted. Now with calf. Last calf Sept., '17.....	+	+	SL	SL	—	—
74	Aged cow. Aborted Sept., '17. R. P. Last calf Jan., '17.....	+	+	+	—	—	—
75	Aged cow. Never aborted. Now with calf. Last calf Jan., '18.....	+	+	SL	SL	—	—
76	2½ yrs. Heifer. Now with calf.....	+	+	+	—	—	—
77	Aged cow. Aborted Oct., '16. R. P. Now with calf. Last calf Jan., '18..	+	+	+	SL	—	—
78	Aged cow. Never aborted. Now with calf. Last calf Oct., '17.....	SL	—	—	—	—	—
79	Aged cow. Never aborted. Now with calf. Last calf Jan., '17.....	+	+	+	SL	—	—
80	Aged cow. Never aborted. Now with calf. Last calf May, '17.....	+	+	+	+	—	—
81	Aged cow. Never aborted. Now with calf. Last calf Aug., '17.....	+	+	+	+	+	+

HERD F.

Blood drawn June 27, 1918.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	5 mos. Heifer.....	SL	—	—	—	—	—
2	4 mos. Heifer.....	+	SL	—	—	—	—
3	8 mos. Heifer.....	+	—	—	—	—	—
4	8 mos. Heifer.....	—	—	—	—	—	—
5	4 mos. Heifer.....	—	—	—	—	—	—
6	5 mos. Heifer.....	+	—	—	—	—	—
7	5 mos. Heifer.....	SL	—	—	—	—	—
8	4 mos. Heifer.....	—	—	—	—	—	—
9	6 mos. Heifer.....	—	—	—	—	—	—
10	6 mos. Heifer.....	SL	SL	—	—	—	—
11	5 mos. Heifer.....	+	—	—	—	—	—
12	6 mos. Heifer.....	+	SL	—	—	—	—
13	6 mos. Heifer.....	SL	SL	—	—	—	—
14	7 yrs. Never aborted.....	+	+	SL	—	—	—
15	2 days. Bull calf. Dam is No. 14.....	—	—	—	—	—	—
16	3½ yrs. One calf. Never aborted....	+	+	—	—	—	—

HERD G.

Blood drawn July 22, 1918.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	6 yrs. Sterile for 1½ yrs. Never aborted.....	+	+	SL	—	—	—
2	6 mos. Heifer calf. Dam is No. 1....	+	SL	—	—	—	—
3	2 yrs. One calf. Dam is No. 1.....	+	+	+	—	—	—
4	6 mos. Bull calf. Dam is No. 3.....	+	+	+	+	—	—
5	8 yrs. Four calves. Never aborted....	+	+	SL	—	—	—
6	3 yrs. One calf. Dam is No. 5.....	+	+	+	—	—	—
7	7 yrs. Aborted '13. Four live calves..	+	+	+	+	+	+
8	2 yrs. One calf. Dam is No. 7.....	+	+	+	+	+	—
9	7 mos. Heifer. Dam is No. 8.....	+	SL	—	—	—	—
10	6 yrs. Aborted first calf. Three calves	+	+	+	SL	—	—
11	1½ yrs. Heifer. Not bred.....	+	+	SL	—	—	—
12	3 yrs. First calf died of scours. Not in calf.....	+	+	+	—	—	—
13	6 yrs. Four calves. Never aborted....	+	+	+	—	—	—
14	5 mos. Heifer calf. Dam is No. 13....	+	—	—	—	—	—
15	1 yr. Heifer. Not bred. Dam is No. 13	+	—	—	—	—	—
16	3 yrs. One calf. Now in calf.....	+	+	+	SL	—	—
17	4 mos. Heifer calf. Dam is No. 16....	SL	SL	—	—	—	—
18	9 yrs. Six calves. Never aborted.....	+	+	SL	—	—	—
19	1½ yrs. Heifer twin. Dam is No. 18..	SL	SL	SL	—	—	—
20	1½ yrs. Heifer twin. Dam is No. 18..	+	+	SL	—	—	—
21	2 yrs. One calf.....	+	SL	—	—	—	—
22	3 mos. Heifer calf. Dam is No. 21....	—	—	—	—	—	—
23	11 yrs. Seven calves.....	+	+	+	—	—	—
24	3 yrs. One calf. Dam is No. 23.....	+	+	SL	—	—	—
25	4 mos. Heifer calf. Dam is No. 24....	+	—	—	—	—	—
26	1½ yrs. Heifer. Dam is No. 23.....	+	+	+	+	—	—
27	6 yrs. Three calves. Never aborted....	+	+	+	—	—	—
28	3 yrs. Two calves. Never aborted....	+	SL	SL	—	—	—
29	3 mos. Heifer calf. Dam is No. 28....	SL	—	—	—	—	—
30	3 yrs. One calf.....	+	+	+	—	—	—
31	1 yr. Heifer. Dam is No. 30.....	+	SL	—	—	—	—
32	3 yrs. Two calves. R. P.....	+	SL	—	—	—	—
33	1½ yrs. Aborted first calf.....	+	SL	—	—	—	—
34	1½ yrs. Now in calf.....	—	—	—	—	—	—
35	1½ yrs. Heifer, a twin and a "free martin".....	+	SL	—	—	—	—
36	4 mos. Heifer calf.....	—	—	—	—	—	—

HERD H.

Blood drawn during May, June and July, 1918.

Animal No.	HISTORY	Results of the Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	1 1/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
2	1 yr. Heifer. Not bred.....	—	—	—	—	—	—
3	8 mos. Heifer. Not bred.....	—	—	—	—	—	—
4	1 3/4 yrs. Heifer. Not bred.....	+	SL	—	—	—	—
5	1 1/4 yrs. Heifer. Not bred.....	+	—	—	—	—	—
6	1 1/2 yrs. Heifer. Not bred.....	+	+	+	—	—	—
7	1 3/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
8	1 3/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
9	1 1/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
10	1 3/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
11	8 mos. Heifer. Not bred.....	—	—	—	—	—	—
12	1 3/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
13	11 mos. Heifer. Not bred.....	—	—	—	—	—	—
14	10 mos. Heifer. Not bred.....	—	—	—	—	—	—
15	1 yr. Heifer. Not bred.....	—	—	—	—	—	—
16	1 yr. Heifer. Not bred.....	—	—	—	—	—	—
17	1 yr. Heifer. Not bred.....	—	—	—	—	—	—
18	1 yr. Heifer. Not bred.....	—	—	—	—	—	—
19	1 1/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
20	1 1/4 yrs. Heifer. Not bred.....	—	—	—	—	—	—
21	13 yrs. Never aborted.....	—	+	—	—	—	—
22	8 yrs. Two calves. Sterile.....	+	+	—	—	—	—
23	14 yrs. Aborted '15. Last calf '18....	+	SL	—	—	—	—
24	7 yrs. Dystocia first calf.....	+	+	+	—	—	—
25	8 yrs. Dead calf '14. Live calf '15, '16 and '18.....	+	+	+	+	+	SL
26	5 mos. Bull. Dam is No. 25.....	+	+	—	—	—	—
27	5 yrs. Aborted '15. Had heifer calf '15. R. P. '17.....	+	+	+	+	+	+
28	7 yrs. Aborted '16. Sterile '17. Now in calf.....	+	+	+	—	—	—
29	3 yrs. Aborted first calf Feb., '18. Dam is No. 28.....	+	+	+	+	+	+
30	9 yrs. Never aborted.....	+	SL	—	—	—	—
31	9 yrs. Never aborted.....	—	—	—	—	—	—
32	3 yrs. First calf Feb., '18. Dam is No. 31.....	+	+	+	+	+	+
33	20 days. Heifer calf. Dam is No. 32..	+	+	+	+	+	+
34	5 yrs. Aborted '16. Calved '17, '18....	+	+	+	—	—	—
35	5 mos. Bull calf. Dam is No. 34.....	+	—	—	—	—	—
36	9 yrs. Never aborted.....	—	—	—	—	—	—
37	2 mos. Bull calf. Dam is No. 36.....	—	—	—	—	—	—
38	3 yrs. Calved Dec., '17. Afterwards hydrosalpinx. Sterile.....	—	—	—	—	—	—
39	6 mos. Bull calf. Dam is No. 38.....	+	+	—	—	—	—
40	3 yrs. Calved Feb., '18. Bred many times since.....	—	—	—	—	—	—
41	5 days. Heifer calf. Dam is No. 40..	+	+	+	SL	—	—
42	3 yrs. Now with calf.....	+	+	+	+	+	+
43	3 yrs. Aborted '16. Not bred.....	+	+	+	+	+	+
44	8 yrs. Aborted '17. Always live calves before.....	+	+	—	—	—	—
45	3 yrs. "Free martin." Dam is No. 44.	+	+	+	+	—	—
46	6 yrs. Aborted '16. Calved '17. Now in calf.....	+	+	SL	—	—	—
47	3 yrs. First calf died. Dam is No. 46.	+	+	—	—	—	—
48	10 yrs. Never aborted.....	—	—	—	—	—	—
49	4 yrs. Two live calves.....	+	+	+	SL	—	—
50	8 mos. Heifer. Dam is No. 49.....	+	+	+	+	+	+
51	5 yrs. Two calves.....	+	+	+	+	+	+
52	8 yrs. Never aborted.....	+	+	+	+	—	—
53	5 yrs. Two calves.....	+	+	+	+	—	—
54	9 yrs. Never aborted.....	+	+	+	+	—	—
55	9 yrs. R. P. '17. Bred six times.....	+	SL	—	—	—	—
56	7 yrs. R. P. Shy breeder. Three calves.	+	—	—	—	—	—
57	3 mos. Heifer calf. Dam is No. 56....	—	—	—	—	—	—
58	6 yrs. Four calves. Never aborted....	+	+	+	+	SL	—
59	4 mos. Heifer calf. Dam is No. 58....	—	—	—	—	—	—

HERD H—Continued.

Animal No.	HISTORY	Results of the Agglutination Test					
		0.05 1-20	0.02 1-50	0.01 1-100	0.005 1-200	0.002 1-500	0.001 1-1000
60	8 mos. Heifer.....	—	—	—	—	—	—
61	5 yrs. Three calves. Never aborted..	+	+	+	+	+	+
62	3 yrs. Heifer. Malformed genitals. Killed.....	—	—	—	—	—	—
63	3 yrs. One calf. Now with calf.....	+	+	—	—	—	—
64	5 yrs. Three calves. Never aborted..	—	—	—	—	—	—
65	5 yrs. First calf dead. Two calves. Now with calf.....	+	+	+	SL	—	—
66	8 yrs. Never aborted. Last calf April, '18.....	+	+	—	—	—	—
67	1 day. Heifer calf. Dam is No. 66...	+	+	+	+	+	+
68	5 yrs. Two calves. Dam is No. 66....	+	+	+	+	+	+
69	2 mos. Heifer calf. Dam is No. 68....	+	+	+	—	—	—
70	4 yrs. One calf. Now with calf. Dam is No. 66.....	+	+	+	—	—	—
71	2 mos. Heifer calf. Dam is No. 70...	SL	—	—	—	—	—
72	3 yrs. Aborted '17. Dam is No. 66....	+	+	+	+	+	+
73	6 mos. Bull calf. Dam is No. 72.....	+	+	+	—	—	—
74	5 yrs. Two calves. Never aborted.....	+	+	+	—	—	—
75	9 yrs. R. P. '18. Never aborted.....	+	SL	—	—	—	—
76	5 mos. Bull calf. Dam is No. 75.....	+	+	+	—	—	—
77	5 yrs. Never aborted.....	+	+	+	—	—	—
78	2 yrs. Now with calf. Dam is No. 77.	+	+	+	—	—	—
79	4 yrs. One calf. Bred seven times. Dam is No. 75.....	+	+	SL	—	—	—
80	2 mos. Heifer calf.....	—	—	—	—	—	—
81	6 yrs. Five calves.....	—	—	—	—	—	—
82	3 mos. Heifer calf. Dam is No. 81...	—	—	—	—	—	—
83	8 yrs. R. P. Never aborted.....	+	+	+	—	—	—
84	5 mos. Bull calf. Dam is No. 83.....	+	+	+	+	SL	—
85	11 yrs. Has been sterile.....	+	+	—	—	—	—
86	7 mos. Bull calf. Dam is No. 85.....	SL	SL	—	—	—	—
87	4 yrs. Two calves. Dam is No. 85....	+	+	+	—	—	—
88	5 mos. Bull calf. Dam is No. 87.....	+	+	+	—	—	—
89	10 yrs. Had calf with abortion exu- date in '18.....	+	+	+	+	+	+
90	1 day. Heifer calf. Dam is No. 89....	+	+	+	—	—	—
91	4 yrs. One calf. Dam is No. 89.....	+	+	—	—	—	—
92	4 mos. Heifer calf. Dam is No. 91....	—	—	—	—	—	—
93	4 yrs. One calf.....	+	—	—	—	—	—
94	12 yrs. Last calf Feb., '17. Metritis..	+	+	+	+	+	+
95	4 yrs. One calf. Dam is No. 94.....	—	—	—	—	—	—
96	9 mos. Bull calf. Dam is No. 95.....	+	+	SL	—	—	—
97	7 yrs. Five calves. R. P. in '14.....	+	—	—	—	—	—
98	2 weeks. Heifer calf. Dam is No. 97..	—	—	—	—	—	—
99	8 yrs. Aborted '13. No trouble since..	SL	—	—	—	—	—
100	3 yrs. Aborted first calf.....	+	+	+	+	+	+
101	4 mos. Heifer calf.....	—	—	—	—	—	—
102	9 yrs. Calved regularly.....	+	+	+	—	—	—
103	1 day. Heifer calf. Dam is No. 102...	+	—	—	—	—	—
104	3 yrs. Now in calf. Dam aborted three times.....	+	+	+	—	—	—
105	2 yrs. Calved '18.....	+	—	—	—	—	—
106	1 mo. Bull calf. Dam is No. 105.....	+	—	—	—	—	—
107	9 yrs. Aborted '13 and '15. R. P. Three living calves.....	+	+	+	+	+	—
108	4 mo. Bull calf.....	+	+	+	—	—	—
109	6 yrs. Has been sterile.....	+	+	+	SL	—	—
110	8 yrs. Troubled with sterility since 1915.....	SL	—	—	—	—	—
111	4 yrs. Herd bull.....	+	+	SL	—	—	—
112	3 yrs. Herd bull.....	+	+	SL	—	—	—
113	5 yrs. Herd bull.....	+	+	—	—	—	—
114	2 yrs. Herd bull.....	+	+	—	—	—	—
115	1 yr. Herd bull.....	+	+	SL	—	—	—
116	4 yrs. Herd bull.....	—	—	—	—	—	—
117	1 yr. Herd bull.....	+	+	+	SL	—	—

HERD I.

Blood drawn July 26, 1918.

Animal No.	HISTORY	Results of Agglutination Test					
		0.05	0.02	0.01	0.005	0.002	0.001
		1-20	1-50	1-100	1-200	1-500	1-1000
1	2 yrs. Heifer. Just aborted first calf.						
2	R. P.	+	+	+	—	—	—
3	6 mos. Bull calf.	+	—	—	—	—	—
4	3½ yrs. Never aborted.	+	SL	SL	—	—	—
5	7 mos. Bull calf. Dam is No. 3.	+	SL	—	—	—	—
6	8 mos. Bull calf.	+	—	—	—	—	—
7	6 mos. Bull calf.	+	SL	—	—	—	—
8	7 mos. Bull calf.	+	SL	—	—	—	—
9	8 mos. Bull calf.	+	—	—	—	—	—
10	2 mos. Bull calf.	+	—	—	—	—	—
11	6½ yrs. Never aborted.	+	—	—	—	—	—
12	3 mos. Bull calf. Dam is No. 11.	+	+	SL	—	—	—
13	3 mos. Bull calf.	+	—	—	—	—	—
14	3½ yrs. R. P. '17.	+	SL	—	—	—	—
15	2 mos. Bull calf. Dam is No. 14.	+	+	—	—	—	—
16	3½ yrs. Never aborted.	+	—	—	—	—	—
17	2 mos. Heifer calf. Dam is No. 16.	SL	—	—	—	—	—
18	2 mos. Heifer calf.	+	—	—	—	—	—
19	5½ yrs. R. P. '17.	+	SL	SL	—	—	—
20	2 mos. Heifer calf. Dam is No. 19.	+	SL	—	—	—	—
21	2 mos. Heifer calf.	+	+	—	—	—	—
22	2 mos. Heifer calf.	+	—	—	—	—	—
23	3¾ yrs. Heifer. Never aborted.	SL	—	—	—	—	—
24	2 mos. Heifer calf. Dam is No. 23.	+	+	SL	—	—	—
25	2 mos. Heifer calf.	+	SL	—	—	—	—
26	4½ yrs. Never aborted.	+	+	+	—	—	—
27	2 mos. Heifer calf. Dam is No. 26.	+	+	+	—	—	—
28	3 mos. Heifer calf.	SL	—	—	—	—	—
29	2 mos. Heifer calf.	+	+	SL	—	—	—
30	2 mos. Heifer calf.	+	+	+	+	—	—
32	2 mos. Heifer calf.	—	—	—	—	—	—
33	1½ yrs. Has aborted.	—	—	—	—	—	—
34	14 yrs. Never aborted.	+	+	—	—	—	—
35	12½ yrs. Never aborted.	+	+	SL	SL	—	—
36	4½ yrs. Non-breeder. One calf.	SL	+	—	—	—	—
37	3½ yrs. One calf. Aborted '18.	+	+	+	—	—	—
38	3½ yrs. Never aborted.	+	—	—	—	—	—
39	13½ yrs. Never aborted.	+	+	—	—	—	—
40	3 yrs. Never aborted.	SL	SL	—	—	—	—
41	4½ yrs. Never aborted.	SL	—	—	—	—	—
42	4½ yrs. Never aborted.	+	+	+	+	+	+
43	4½ yrs. Never aborted.	+	+	+	—	—	—
44	5½ yrs.	SL	SL	—	—	—	—
45	8½ yrs. Never aborted.	+	+	+	+	+	+
46	8½ yrs. Never aborted.	SL	SL	SL	—	—	—
47	13½ yrs. Non-breeder.	+	+	—	—	—	—
48	9½ yrs. Had dead twins.	+	+	+	+	—	—
49	A new cow in the herd.	+	+	+	+	+	+
50	4½ yrs. Never aborted.	+	+	+	SL	—	—
51	4½ yrs. Never aborted.	+	+	—	—	—	—
52	3½ yrs. History unknown.	+	—	—	—	—	—
53	4½ yrs. Never aborted.	SL	—	—	—	—	—
54	3¾ yrs. Never aborted.	SL	—	—	—	—	—
55	4¾ yrs. Never aborted.	+	—	—	—	—	—
56	4½ yrs. Dropped six weeks calf.	SL	—	—	—	—	—
57	5½ yrs. R. P. '17.	+	SL	—	—	—	—
58	2¾ yrs. Never aborted.	+	SL	—	—	—	—
59	2¾ yrs. One calf.	+	+	+	—	—	—
60	2¾ yrs. One live calf.	+	+	SL	—	—	—
61	11½ yrs. Never aborted.	+	+	+	SL	—	—
62	2¾ yrs. History unknown.	+	—	—	—	—	—

The herd tests have been given in full because they should be considered as a group. A careful study of these reactions shows several important features.

M'Fadyean in 1912 as a result of testing 535 presumably healthy cattle stated that: "One will be justified in regarding complete agglutination with a serum dilution of 1 in 50 or 1 in 100 as strong evidence of infection." Brüll considered that agglutination in a dilution of 1 to 64 was doubtful. From these results, as well as the results of other workers, it has been customary to consider a reaction in a dilution of 1-50 as very suspicious and an agglutination at 1-100 as positive evidence of infection. The results here reported would indicate that this standard was too high. Many calves, especially from 6 to 8 months of age, do not react with 0.05 c.c. (1-20 dilution). Also many cows which have not aborted and heifers do not react with this amount of serum. On the other hand, several animals with clear histories of abortions do not react above 0.02 c.c. (1-50). In the beginning of this work we used for our first tube 0.1 c.c. of serum (1-10 dilution). In many instances we found animals the blood serum of which did not agglutinate with this amount. The discoloration which this large amount of serum caused in the test fluid and the consequent difficulty of reading the tube caused us to abandon it as a routine test. It would seem as a result of these observations as if an agglutination with 0.05 c.c. serum (1-20 dilution) should be considered as an indication that the animal has been or is infected with *Bact. abortus*. The agglutinating antibodies might also be derived from the dam and the individual never harbor the germ as in the case of a very young calf.

Rettger and Davis pointed out that: "Calves give the same blood reactions at the time of birth as their dams. Whether positive or negative at the beginning of extra-uterine life, all become non-reactors by the time they are six to seven months of age. Some change from positive to negative within the first two or three months, while the greater number require a somewhat longer period." The results here reported do not bear out the first part of this statement in that calves have the same agglutination titre as their dam. Some calves do have the same agglutination reactions as the cows but others do not. From the results of our work we cannot verify Rettger and Davis's statement in this particular. In part this is explained by the fact that they employed only 1-50 and 1-100 dilutions. Our work does show, however, that animals from six to ten months of age as a rule

fail to react even though they may have given positive tests earlier in life. This agrees with Rettger and Davis's conclusions, and is a very important point to keep in mind when considering the test from the control standpoint. As had been pointed out, this period seems to be the most critical in the life of the animal and all possible precautions should be taken to guard against infection.

A comparison of the tests from the different herds shows that the total number of strongly positive reactions are much higher in herds which have large numbers of animals aborting. This is strikingly shown by a comparison of the tests of Herds D and E with those of Herds C and I. On the other hand, it will be noted that many discrepancies are shown in tests of individuals as compared with their breeding histories. A positive reaction does not signify that an animal has aborted or will abort. On the other hand, a failure to agglutinate with large amounts of serum (in low dilution) does not mean that an animal will not abort in the present or future pregnancies. The test cannot be relied on to pick out individual aborters. As was stated by Mohler and Traum, it simply indicates that the animal has been or is at present infected with *Bact. abortus*. The cow may be immune and a very valuable animal to place in one's herd.

DISCUSSION.

Several investigators have pointed out the great significance of the serological tests in the control of contagious abortion. Schroeder and Cotton state that: "To prevent the further spread of abortion disease owners of uninfected cattle should be instructed to have careful agglutination tests for abortion disease made of all cattle they propose to introduce into their herds." Rettger and Davis say that: "The serological tests are an important aid in the inauguration of preventive measures." Van Es in his discussion of abortion disease makes a very conservative statement in regard to the value of the blood tests. He says: "Those tests, thus, can only indicate that the infection is or was present, but beyond that they show nothing. In spite of this shortcoming, however, they have some practical value. When, for instance, a first abortion occurs the test applied to blood samples taken from all the animals comprising the herd may not only indicate that true abortion disease is present, but will also point out just what animals may be positively infected. The tests are valuable to show herd infection as well as the extent of its

distribution in a herd, but at no time can they be depended upon to disclose whether or not a given pregnant animal will abort. Their value therefore must not be overestimated."

The results of the work here reported show that the blood tests interpreted according to our present knowledge have a very limited value in the control of this widespread disease. The agglutination test indicates the relative amount of infection existing in different herds. In badly infected herds the number of positive reactors will be much larger than in slightly infected ones. Nearly all investigators so far agree that the test cannot be relied on to give results that will state that an animal has aborted or will abort. The test has a very limited value in indicating the infection of a calf and practically no value in indicating whether a yearling heifer will become an aborter. As has been pointed out, animals from ten months to a year of age nearly always do not agglutinate even when large amounts of serum are used.

The tests have been stated to have a particular value in indicating the presence of contagious abortion in a herd where but one or two abortions have occurred. In these cases, however, the possibility must be kept in mind that the aborting animals may fail to react soon after the act of abortion and still be infected with abortion disease. It would seem that a breeder who has one or two abortions in his herd would be much safer to consider them as infectious in character and take the proper measures to prevent the spread of the disease than to rely on results of the blood tests to indicate the presence of the disease with their possibility of giving a negative result, even though the herd was actually infected. We do not deny the possibility of accidental abortions or abortions due to drugs, etc., but we do believe that these in comparison to those due to abortion disease are very uncommon.

The results here reported indicate that the agglutination test is an unsafe basis upon which to judge the merits of individual animals as regards abortion disease. An animal may react positively which has never aborted or may never abort. On the other hand, some animals may be infected and not have the agglutinating antibodies at the time of taking the blood sample. A breeder would be far safer to buy an animal with a good breeding history, or, better, from a herd which has had little trouble with abortion disease, than to rely on the results of the agglutination test.

Further study of these tests is under way and we intend to find out in particular the agglutinating titre of the blood from beef cattle. Abortion disease is spreading rapidly to our range animals and here it is even more of a problem to control than among the dairy breeds. It is quite possible that further research will show how to interpret the results of the blood tests so that they may be applied more advantageously in controlling abortion among cattle.

CONCLUSIONS.

1. The complement fixation test seems to have no advantage over the agglutination test in the diagnosis of contagious abortion.
2. The technic of the agglutination test is simpler than that of complement fixation and the results of the agglutination test are not influenced by as many factors (conglutinine, etc.).
3. The results of the agglutination test show the relative amount of herd infection. The test cannot be relied on to pick out individual aborters.
4. The blood of calves may have the same agglutination titre as that of their dams. Many, however, react differently.
5. The agglutination test of animals from 8-10 months of age usually shows that agglutinating antibodies are not present in their blood.
6. Herd bulls often react positively to the agglutination test.
7. At present the results of the agglutination test cannot be utilized as a basis for control measures for abortion disease.

REFERENCES.

- Bordet, J. et Gay, F. P. Sur les relations der sensibilisatrices avec l'alexine. *Annal. de l'Inst. Pasteur.* T. 20 (1906), p. 467.
- Brüll, Z. Beitrag zur Diagnostik der infektiösen Abortus des Rindes. *Berlin. tier. woch. Jr.* 27 (1911), S. 721.
- Ehrlich und Sachs. Ambosepter oder Sensibilisater. *Berliner klinische. wochen* (1902), S. 492.
- Evans, Alice C. Further studies on Bacterium Abortus and related bacteria. *Jour. of Infec. Dis.* Vol. 22 (1918), p. 580.
- Fitch, C. P. Report of the Conglutination test with special reference to the diagnosis of glanders. *Rept. N. Y. State Vet. College* (1914-15), p. 102.

- Grinsted, P. Die Agglutinationsprobe als Diagnostikum beim seuchenhaften Verwerfen der Rinder. Maanedsskrift for Dyrlaeger; Bd. 21. Rev. in Berl. tier. woch. Jr. 25 (1909), S. 831.
- Hadley, P. A plea for the standardization of reports of agglutination tests. Jour. Immunology. Vol. II (1917), p. 463.
- Holth, H. Die Agglutination und die Komplementbindungsmethode in der Diagnosis des seuchenhaften Verwerfens der Kühe. Berlin. tier. woch. Jr. 25 (1909), S. 686.
- Huddelsen, I. F. The Transmission of Bacterium Abortus (Bang) to new born calves through the ingestion of milk. Tech. Bull. No. 32, Mich. Agric. Expt. Sta.
- Larson, W. P. The complement fixation reaction in the diagnosis of contagious abortion of cattle. Jour. o. Infec. Dis. Vol. 10 (1912), p. 178.
- M'Fadyean, J. Preliminary note on the sero-diagnosis of Glanders. Jour. Comp. Path. & Ther. Vol. IX (1896), p. 322.
- M'Fadyean and Stockman. Observations on the distribution and diagnosis of epizootic abortion of cattle. Jour. Comp. Path. & Ther. Vol. XXII (1909), p. 264.
- M'Fadyean and Stockman. The Agglutination Test in the diagnosis of contagious abortion. Jour. Comp. Path & Ther. Vol. XXV (1912), p. 22.
- Mohler and Traum. Infectious abortion of cattle. Ann. Rept. B. A. I. (1911), p. 147.
- Moore, V. A., and Fitch, C. P. A Study of Infectious Abortion of Cattle. Rept. N. Y. State Vet. College (1912-13), p. 82.
- Rettger and Davis. Infectious Abortion in Cattle. Bull. No. 93, Storrs Agr. Exp. Sta.
- Schroeder, E. J., and Cotton, W. E. Some Facts About Abortion Disease. Jour. Agr. Research. Vol. IX (1917), p. 9.
- Schütz u. Miessner. Zur Serodiagnosis der Rotzkrankheit. Archiv. f. wiss. u. prak. Tierheilk. Bd. XXXI (1905), p. 353.
- Seddon, H. R. Some observations on the methods of using the agglutination test in the diagnosis of the disease in bovines caused by the bacillus of contagious abortion. Jour. Comp. Path. Ther. Vol. XXVIII (1915), p. 20.
- Surface, F. M. The diagnosis of infectious abortion in cattle. Bull. No. 166, Ky. Agr. Exp. Sta. (1912).

- Surface, F. M. The inhibiting effect of excess cow serum in complement fixation with infectious abortion. *Zeit. f. immu. u. exp. ther.*, 1, Teil. Orig. Bd. 17 (1913), S. 487.
- Thomsen, Axel. Zur Technik der Komplementbindung beim seuchenhaften Verwerfen des Rindes. *Zeit. f. infek. para. kran. u. hyg. d. haus.*, Bd. 13 (1913), S. 175.
- Van Es, L. Abortion Disease in Cattle. *Cir. 18, North Dakota Agr. Exp. Sta.*
- Wall, S. Über die Feststellung des seuchenhaften Abortus beim Rinde durch Agglutination und Komplementbindung. *Zeit. f. infek. para. kran. u. hyg. d. haus.*, Bd. 10 (1911), S. 23.
- Williams, W. L. Researches upon Contagious Abortion of Cattle. *Rept. N. Y. State Veterinary College (1914-15)*, p. 63.

SUGGESTIONS FOR LEGAL AND REGULATORY MEASURES AGAINST BOVINE INFEC- TIOUS ABORTION.*

WARD GILTNER,
Michigan Agricultural College, East Lansing, Michigan.

The objective goal of research into the cause and nature of communicable diseases of live stock is the establishment of a sound basis for control and eradication where possible. The recording of personal observations and experiences and the discussion of the whole matter privately or publicly have the same purpose. It is very interesting to trace the historical development of the various animal diseases or plagues that science and practice have succeeded in allocating to the various and proper spheres of activity in the fields of animal husbandry and veterinary science. There are those that the stockman, with or without veterinary approval, is considered, by himself or others, to be competent to deal with adequately; another group is quite satisfactorily dealt with by and through the local practitioner with or without the coöperation of the properly constituted live stock sanitary authorities; and there is yet another group that is so serious in its possibilities and so peculiar in its characterization that only local, state or federal or even international live stock sanitary officials, working alone or in coöperation, are competent to eradicate or attempt to control.

*Presented at 55th Annual Meeting A. V. M. A., Philadelphia, 1918.

It will not be necessary for me, and it is not my purpose, to even suggest examples naturally falling under the groups outlined. Each of you is able to quickly classify the infectious and other parasitic diseases in a general way so that they will fall into these three groups and the live stock sanitarian is constantly under the necessity of thus weighing the seriousness of these diseases and officially treating them accordingly. To such a degree of exactitude have live stock sanitary procedures arrived that uniformity, with periodic but slight revisions, has been attained in many instances.

Where in our suggested grouping shall we place bovine infectious abortion? Certainly the stockman, himself, has not demonstrated his ability to meet the issue successfully. A careful study of the disease, however, must convince one that much of the work of control and eradication will ultimately fall to the lot of the stockman, but only when he has been properly instructed and made to realize the seriousness of the disease and the part that he must play in the work of eradication. Many cattle owners are ready and eager for this instruction, many more are skeptical but receptive when the instructions are intelligible and promise favorable results at a reasonable expenditure of energy and money, still others are so hopelessly ignorant and shiftless or, worse still, so cunningly dishonest that they could never play any active part in assisting in the work of control but might play a passive rôle or even actively resist measures to combat the disease. There is some hope of utilizing the first two groups of stockmen in eradication work, but nothing short of the strong arm of the law will suffice to deal with the last group. Unfortunately for the sanitarian communicable animal diseases are just as prone to attack the cattle of one group as those of another.

To what extent shall or can we depend upon the local practitioner for the work of control and eradication of infectious abortion? It seems to me that herein lies our great hope. With ever-increasing frequency we are hearing of the lessened incomes from horse practice and the great future in cattle practice. Without attempting to discuss the relative merits of these two lines of veterinary practice, we may say with some assurance of correctness that in the field of cattle practice infectious abortion is responsible for a large part of the veterinarian's work. Especially is this true in so far as abortion disease or *Bact. abortus* infection is directly or indirectly accountable for breeding troubles of

cattle. The breeding difficulties following or complicating abortion disease are hardly the point of attack but, rather, the result of factors that should receive the attention of the sanitarian. We think that we can see some difficulty in interesting the practitioner to the extent that he will be at all anxious to focus his attention and that of his client on the matter of removing causes rather than on the less fundamental work of repairing damages wrought by these causes. This is probably the inherent weakness in leaving sanitary work of any kind to the unofficial practitioner. Not until the veterinarian is placed in the position of a semi-public official and made to function as such, can he be of the greatest service in the control and eradication of animal plagues. As things now stand, the practitioner can do a great deal for his client in the way of protecting him against unfortunate purchases and in overcoming the evils resulting from the effects of abortion infections, provided, of course, he is willing to keep himself posted on the developments of his science in connection with the disease. We are noting with much satisfaction a healthy yet critical attitude on the part of veterinary associations and periodicals toward the abortion and sterility problem. Veterinary colleges must take on abortion and sterility as one of their major projects if they are to serve animal husbandry and their profession. The practitioner also has a duty to his client in the matter of protecting his reputation when sales of cattle are involved. We have on a number of occasions been consulted by stockmen anxious to maintain fair dealings. It will be admitted that it is a matter requiring intimate and accurate knowledge of the disease in addition to a judicial frame of mind to properly advise in these cases. We believe, then, that it would be possible for the veterinarian in practice to deal with the abortion problem, as well as it can be dealt with at present, provided he were willing to keep himself informed and provided he were able to command the proper response from his client.

The control of the disease by the official sanitarian is the subject properly under discussion in this paper. The writer is afflicted with the same complaint that all our live stock sanitary officials suffer from, viz., a reluctance to tackle the problem. We all wish that the whole matter could be handled by the local practitioner or possibly by the specialist; but we all know it isn't being handled as it should be. Personally I see no very promising legitimate field for the itinerant specialist and certainly the local practitioner is having his troubles. Perhaps the whole

difficulty is traceable to the research man who, we must confess, has failed to make himself very clear to the practical man, probably because the subject is not yet clear in his own mind. One thing that we may hope for and expect from the official sanitarians is recognition of the existence and seriousness of the disease and an effort on their part to include it in the list of dangerous communicable diseases and to make a start in treating it as such. It seems to me that such a step would encourage the local practitioner to warn his clients of the impending legal status of the disease and the significance of such a status. Quite certainly nothing is to be gained by awaiting the demands of the human sanitarians to control the disease because of its inter-communicability to man, no satisfactory evidence of such transmission having been adduced and much evidence to the contrary being available.

Universally the live stock sanitary authorities of America have lacked the courage to undertake the problem of eradicating infectious abortion in the vigorous manner that they have fought other infectious diseases. Let us hasten to come to their defense, however, at the expense of the investigators who, it may be averred, have failed to furnish any tangible facts on which to build any program of eradication.

As early as March 24, 1909, the Committee of the British Board of Agriculture and Fisheries reported on the official control of abortion, making these statements: "With a few exceptions the witnesses expressed themselves as strongly in favor of compulsory notification of cases of abortion and premature calving. No witness was altogether opposed to notification being made compulsory, but one or two appeared to have formed the opinion that it might be advisable not to require notification except when several cases of abortion had already occurred in a herd, and one witness thought that the society which he represented would not approve of compulsory notification unless it were accompanied by enforced restrictions on animals that had aborted."

"Seeing that all the witnesses who appeared before us accepted the view that the disease is contagious, it is not surprising that they were all agreed that a stop should be put to what appears to be a very common practice, viz., that of selling cows that have recently aborted. Speaking generally, it may be said that the evidence laid before us with regard to this point indicates that public opinion is ripe for the placing of restrictions on the move-

ment of cows that have recently cast their young from contagious abortion."

"The evidence with regard to this point [restrictions on exposed cows] was less unanimous. The majority of the witnesses expressed themselves as being personally in favor of placing some restrictions on the movement of pregnant cows known to have been recently exposed to risk of contagion, and still more strongly in favor of preventing the free movement of pregnant cows proved by some reliable test to be actually infected."

"Three witnesses were opposed to any interference with animals only suspected on the ground of exposure to risk of contagion, but thought that restrictions should be placed on the movement of in-contact cows ascertained to be actually infected."

"One witness believed that the members of the society which he represented would object to any interference with pregnant animals known to have been exposed to risk of contagion."

"Five of the witnesses deprecated any delay, and thought that immediate action should be taken, at least to the extent of compelling notification of the disease and imposing some restriction on the movement of cows that have recently aborted. Only one witness thought that it would be better not to do anything at present except to set about educating farmers and stock-owners as to the pathology of the disease, while two were in favor of delay for a year or two, provided there was a prospect that in the interval some valuable new discovery regarding the means of dealing with the disease might be made."

"It cannot be denied that some owners succeed over long periods in keeping their herds free from this disease. In some cases chance, more than foresight, appears responsible for this result—the owner has been lucky enough never to purchase an infected animal. In other cases the herd has been kept healthy because it has been mainly self-supporting, only a few animals being purchased from herds known to be free from the disease."

"It is obvious, however, that in the ordinary circumstances in which the cattle trade of this country is conducted breeding or milking herds must, as a rule, be recruited by the purchase of cows or heifers without any real assurance that they have not been exposed to the risk of contagion, and in the absence of such an assurance the purchaser has no safeguard, since infected animals display no symptom by which their dangerous character can be recognized. Broadly speaking, therefore, private effort

alone is foredoomed to failure as a means of preventing the spread of epizootic abortion. And in this connection we may say that we cannot accept the suggestion that the existing state of affairs would be sensibly ameliorated if farmers were better informed regarding the pathology of the disease. We feel bound to accept the view put before us by the majority of the witnesses, that the fundamental fact concerning the disease—its contagious nature—is now very generally known to stock-owners. Sinister evidence of this is furnished by the too common practice of immediately selling a cow that has aborted, and of exposing her for sale together with a calf falsely represented to be her own.”

“Public or state intervention with a view to prevention of a contagious disease appears to be justified when—

- (1) It is recognized that private or individual effort as a means of combating the disease is from the nature of the case inadequate;
- (2) Knowledge regarding the disease has reached such a point that it is possible to devise regulations which are likely to prove effectual if enforced by law;
- (3) The weight of opinion amongst those whose interests are affected by the disease is in favor of state control;
- (4) The loss occasioned by the disease when uncontrolled exceeds the probable cost of the measures required to counteract it.”

RECOMMENDATIONS.

“We, therefore, recommend that, as a preliminary measure, epizootic abortion in cattle should be dealt with under an order of the Board of Agriculture and Fisheries requiring—

- (1) Compulsory notification of suspected cases of the disease;
- (2) Veterinary inquiry to establish the existence of disease on any particular premises; and
- (3) Temporary isolation and restrictions on the movement of any cow that has recently aborted.

“We also consider that in the event of effect being given to the above recommendations, such measures as may be thought necessary should be taken to avert the possible introduction of infection in cows imported into Great Britain from Ireland, the Channel Islands, or the Isle of Man.”

The action of the British Board of Agriculture and Fisheries is highly commendable and the report of its committee very interesting and valuable and the committee's recommendations wise and courageous. Similar action in America is needed.

So far as we know there has been no official inquiry made into the abortion situation in America with a view to definitely laying plans for its official control. At the 1916 meeting of the U. S. Live Stock Sanitary Association a Committee on abortion was authorized. At the 1917 meeting of the association a report was made which attempted to summarize our knowledge of the disease. Possibly those who have read the report are impressed by the fact that it is more of a summary of our ignorance of the disease. At any rate, your attention is called to a few questions that are *a propos* and the brief paragraph in answer thereto.

Is the abortion situation in the research, extension (educational) or regulatory stage?

What should be the official attitude toward the disease?

Should abortion be classed as an infectious disease within the meaning of the law?

Give your suggestions for a practical method of control.

Is the "state accredited herd plan" feasible?

Are we ready for uniform measures of treatment and control?

"Nearly everyone admits that infectious abortion is in the research stage, about half of the answers indicate that some educational or extension work might well be done, and only a very few venture to advise that a careful attempt be made in the direction of regulatory measures. Every shade of opinion is expressed relative to the proper official attitude toward the disease. The same is true in regard to classing the disease as infectious within the meaning of the law. The majority, while admitting that it is an infectious disease, would hesitate to treat it as such by regulatory measures until more accurate knowledge is available. A few detailed replies offering many apparently logical suggestions as to practical methods of control were received, but, on the whole, the answers show a very serious lack of agreement on any rational method of procedure such as all can agree upon in the control of many other diseases. The state accredited herd plan does not seem feasible for the present. With the rarest exceptions no one believes that we are as yet ready for uniform measures of treatment and control. Several gratuitously note that uniformity is not possible with any disease."

Surely this is a most discouraging state of mind in which to find American live stock sanitarians. During the present summer letters have been addressed to the state veterinarians of each state requesting information relative to legal and regulatory measures in force in the respective states. While replies were not received in every case, enough was learned to satisfy us that the well-established live stock sanitary boards are reluctant to ask their legislatures for specific laws regulating abortion disease or to make regulations with the powers already possessed. Our present lack of knowledge concerning the disease and the interference with the live stock industry appear to be the excuses offered for taking no action. The fact that some department of the state is engaged in investigations into the nature of the disease is also apparently utilized as an excuse for not doing something officially to control the disease. There is some danger to the cause of eradication in such an attitude. Most assuredly we cannot await the last word on the nature of the disease before taking official steps to mitigate the evil caused by it.

A few quotations from our correspondents will illustrate the frame of mind they are in. "It has not seemed advisable to establish any quarantine regulations in this respect with the present knowledge of that disease, and I do not see how any such law or regulation could be passed and enforced without materially interfering with the live stock industry. To me it appears that the work in this line should be purely educational, and should be taken up not alone with the veterinarian but with the farmer. The farmer himself can do a great deal towards the suppression and control of contagious abortion." Again: "— up to the present time this Board has, because of lack of knowledge, not felt justified in issuing any regulations covering this disease. We do, however, advise owners to observe the three following measures:

- (1) Animals from infected herds are not to be sold except for slaughter purposes.
- (2) No fresh animals to be introduced into the herd.
- (3) Breeders not to be bred until at least a period of three months has elapsed."

"I am of the opinion that it would be wise to issue regulations from time to time as our knowledge of the disease is increased."

Some comment in passing seems desirable on the above quotation, both because of its inherent merit and because of the soundness of its author's judgment. Of the last sentence no discussion

is necessary since it is generally agreed that regulations subject to modification from time to time are far better than specific legislation for the control of most infectious diseases, especially for those concerning which our understanding is in a state of flux. The natural criticism directed toward the quotation is this: If it is wise to advise cattle owners to observe the three measures, why is it not wiser still to enforce the adoption of such advice through official regulations? Personally I do not think a single one of the measures should be or could be enforced for reasons based upon a knowledge of the disease and the way it manifests itself in herds and of the desires and practices of owners of such herds, men having the very best interests of the cattle industry at heart. This is knowledge possessed by all of you. There are occasions when cattle owners should not sell out of infected herds for the public good, or introduce new animals, infected or non-infected, into their own herds, or breed certain cattle within certain variable periods of infection for their own good, and it would be for the best interests of the cattle industry if on such occasions regulatory measures could be enforced, but I question whether they can be enforced at the present time.

We will refer to this matter again, but at this time let us quote further: "Our agricultural law places certain restrictions on diseases in animals of an infectious nature, but we have never attempted any specific measures covering abortion, owing to the lack of knowledge and the confusion that would result were such restrictive measures adopted."

"In my opinion, regulations that could be modified, as occasion might indicate, would be better than specific laws, which are difficult sometimes to amend or change. I do not believe that our present knowledge of the disease is sufficient to warrant attempting much regulation on the movement of animals which may be infected with or exposed to this disease."

Another state veterinarian says: "This subject has been discussed at our board meetings but it has been concluded that until we know more of the disease and the extent of its existence that we could not issue a satisfactory regulation. *If we know of an infected herd we attempt to prevent sales to healthy herds.*" (Italics ours.)

The last sentence in the above quotation contains the thought that should be uppermost in the mind of anyone attempting regulatory interference with the spread of infectious abortion through restrictions on the movement of cattle. There are certainly suffi-

cient reasons for the adoption of such a regulation; there are very valid reasons for preventing the introduction of infected cattle into non-infected herds and usually not sufficiently valid reasons for preventing the introduction of cattle from infected herds into infected herds under proper supervision. Perhaps the most serious obstacle to the execution of such a regulation is the matter of determining what constitutes an infected herd or more particularly an infected animal or vice versa.

Still another quotation from a man of wide experience: " * * * we have no special legislation in regard to this disease, although I believe it could be covered by our general act covering contagious diseases. (This is the case probably in most states. w. g.) However, this would be a very difficult disease to regulate under our sanitary laws, since, as yet, we have not determined at what stage this control should be exercised. In the first place, some of our scientific men who have made extensive experiments in regard to this disease would lead us to believe that every herd is infected with the germ that is believed to be the causative factor in contagious abortion. The question, then, would naturally arise, where the Live Stock Commission or State Veterinarian would draw the line, whether we would quarantine a herd after they had had one abortion take place, provided that a test on the blood of several of these animals showed that the germ was present in the herd, or whether we would test out herds by the complement fixation test and quarantine the same as we would cases of tuberculosis by making the tuberculin test.

"The question naturally arises, inasmuch as the existence of the germ seems to be so general in cattle that show no physical symptoms of its presence, are we sure that this is the true causative factor and how long can it exist in a herd before its ravages are felt?

"Inasmuch as it is the most severe scourge that the dairy interests have to contend with, I believe it would be a wise procedure for each state that has any considerable dairy interests, to appropriate a sum sufficient to keep at least one man busy his entire time in carrying on experimental work in an endeavor to determine positively that the *Bacillus abortus* is undoubtedly the true causative factor, and approximately the length of time that this bacillus may exist in a herd without being transmissible to other animals that might be associated with this herd for a short length of time, such as at fairs or public sales."

Certainly the state veterinarian quoted above is in no state of mind to formulate any very drastic or comprehensive regulations for the control of infectious abortion. Probably the majority of state veterinary officials share his views.

The idea of not interfering with the cattle industry and that very fatal attitude of wanting to do nothing until everyone does the same thing is well expressed in the following: "As a suggestion I do not believe in making such regulations that would be a detriment to the cattle industry of our country, but I fully appreciate the fact that regulations should be in effect as far as possible in order to control, as far as possible, this one disease. I believe that such regulations should be of a universal nature so as to involve every state with the same regulations."

It seems to me that some start toward regulation is now necessary so that the detriment to the cattle industry of the country may be overcome as quickly as possible. While it is true that regulations could be and might be more detrimental to the industry than is the disease itself, yet even our vast ignorance of the disease does not preclude the possibility of drafting and enforcing reasonable and beneficial regulations. To await the universal adoption of uniform regulations is out of the question, being without precedent and without any possibility, or at least probability, of accomplishment, to say nothing of its being unnecessary. *What is needed is wise action, somewhere, suited to local conditions. With laws and regulations for the control of this disease America must proceed in the characteristic American method, the experimental method, applying the initial experiments to localities here and there without endangering the industry as a whole and with the expectation that there will be learned something of value that can be applied, perhaps with modifications, elsewhere. Uniform regulations must be regulations that have stood the acid test of practical experience so far as infectious abortion is concerned.*

One state has evidently made an attempt at some control. The state veterinarian says: "We handle contagious abortion in Indiana under our contagious disease law, which prohibits the transportation of these animals and gives us the right to quarantine the farm where such disease is found. We believe that this trouble should be handled under regulations adopted from time to time, governed by the locality and the amount of disease in such locality, the time it has been present there, etc."

Another state has gone still further. The state veterinarian of Oregon writes: " * * * we have a specific law relative to the making of an affidavit on the part of the owners prior to offering their animals at public sale covering the health of the herd so far as infectious abortion is concerned. Their regulation is as follows: "Animals infected with infectious abortion shall not be sold for purposes other than slaughter until they have been proven free from the infection."

Also: "No public auction sale of any herd or part of a herd of dairy animals, or animals intended for breeding purposes, shall be held except under the process of court, unless all the animals offered for sale have, within twelve months prior to such sale, been submitted to a tuberculin test and received a certificate of health from a qualified veterinarian, setting forth the following facts: That the animals have given a negative reaction to a Board-approved method of tuberculin test administered in a careful, correct and conscientious manner; *that the owner has executed a sworn statement that no infectious abortion or abortion disease (characterized by a premature delivery of the foetus, retained placenta or sterility) has existed in the herd for a period of two years next preceding the date of the sale; or, that abortion or abortion disease has existed in certain animals of the herd within a period of two years next from the date of sale, and that certain stated animals have aborted or exhibited other symptoms but appear to be free from the disease. Such statement, if abortion or abortion disease is reported to have been present within the herd within two years next from date of sale, must be announced to the patrons of the sale by the auctioneer, who is by this Act held equally liable with the owner for the violation of this section; provided, the Board may exempt from inspection and the tuberculin test the bovine animals offered for sale at public auction in any certain district in Oregon, in which tuberculosis and abortion or abortion disease is not known to exist or be prevalent. Such public sale inspection exemption must be in writing and must be issued by authority of the State Live Stock Sanitary Board and must be signed by the President and Secretary of the Board.*"

To quote further: "The subject of infectious abortion is one in which regulations and legal requirements will not produce definite results because too little is known of the etiology and cause of the disease. I believe that good results can be had by requiring owners to make affidavits concerning the health of

their herd. They will then not be disposed to get rid of a badly diseased herd which, generally speaking, must be conceded to be the most dangerous procedure that can be carried out."

The attention of interested parties is directed to a note in the April, 1918, number of the American Journal of Veterinary Medicine by Dr. Dyson, who proposes a bill to the Illinois legislature the main points of which are as follows:

"No cow or heifer, except unbred heifers under two years of age, shall be imported into Illinois for dairy or breeding purposes (1) unless said animal is within four weeks of completing full term of gestation; or, (2) unless said animal has within a period of six months given birth to a live and fully matured calf; or, (3) unless the owner makes affidavit, certified by the live stock sanitary authorities of his state, that his herd and premises are free from infectious abortion. (4) To cows or heifers sold at public auction within the state of Illinois the same rules are to apply."

In conclusion permit me to quote a paragraph made in the June number of the same periodical in reply to Dr. Dyson's proposal:

"As a general principle I would oppose the suggestion of Dr. Dyson on these grounds: Live stock sanitary legislation or public health legislation in general should never attempt to direct the activities of public servants in detail, but the proper officials should be clothed with adequate powers enabling them to promulgate and to enforce regulations respecting any disease or condition that may exist under any set of circumstances. Such a system would demand only the highest types of public officials, only those who could be trusted absolutely. It is to such officials and to such a system that I look for relief in the control of abortion, but not until a vast outlay of money, time and energy (mental particularly) have been judiciously expended in studying the disease in an effort to answer the many unanswered questions about the disease."

DISCUSSION ON PAPERS OF DRs. FITCH AND GILTNER.

DR. POTTER: In conducting this discussion I will not attempt to differ to any great extent with the writers, but simply to amplify some of the statements which they have made. Dr. Fitch has gone with some detail into the discussion of the past. I will not attempt to go into that, but I will try to point out some

of the shortcomings of the test when applied to field conditions. He has told you of the many difficulties encountered when applying the fixation test, and that the agglutination test is apparently much more reliable in reaching a diagnosis, and that it has not the same amount of difficulty connected with its application.

He brought out one thing which is very significant in connection with this disease, and that is the secondary infections and also the allied conditions of sterility and retained afterbirth. As to the secondary infections the importance of those are emphasized by their absence in the cattle under range conditions. We know how difficult it is to handle abortions in dairy cattle, but when we come to range cattle it is far less serious. The range cow is living out of doors, under natural conditions. Usually the herd is what we call new soil. When the infection hits it, it hits it hard. The disease goes through the herd like wildfire, and then subsides almost as quickly as it began. We have no secondary infections. The animal is not subject to the stable infections which make this disease so serious in dairy cattle. I believe that shows the importance, therefore, of the secondary infections.

He has referred to the work of Rettger, and I think most investigators know of his work, which has recently been published. In his work, while there are many things with which we cannot agree, still much valuable work has been done in attempting to show the critical period—that is, when the infection is most apt to take place. We cannot agree with Rettger in his estimate of the value of these tests. He seems to think a reaction means infection and the presence of the organism in the animal. Now, if I know anything about the subject at all, it seems to me that indicates the presence of antibodies, not necessarily of the organism; and a reaction may sometimes indicate immunity rather than infection. Therefore an animal which reacts may under some conditions be more valuable to a man than one which does not. So, the tests are of very little value to a man if he wishes to import animals from other herds.

Neither can the serological tests be used as a basis for eliminating animals, because of this fact: That it may indicate immunity rather than infection.

So, I believe Dr. Fitch has brought out very well the fact that the test cannot be relied upon in regulatory work. I believe he brought out its relative value—that is, the relative amount of infection in the herd, which is a good point. I have had that

borne out in my own experience and, further, in regard to the infection of young cattle. I worked with a herd of nearly two thousand animals, a mixed herd of pure breeds and grades divided about equally between mature cattle and young ones. We took blood samples from both herds and tested them out at Washington. The results were remarkable. In practically all of the young stock the reactions were negative, only five or six per cent gave positive reactions. The proportion of abortion among the young animals—that is, in first pregnancy—was about the same. The method of handling the herd was as follows: As soon as heifer calves born in the heavily infected herd were able to maintain themselves under the same range conditions in which they lived, they were removed from the herd and placed on pasture. They were not brought back until about to calve for the first time. They were bred out on pasture by supposedly clean bulls that had not been used for the purpose before. Not until the second pregnancy did they have much difficulty, and then they had plenty of trouble.

And that seemed to show the relative trouble they would have in a herd. I think that bears out Rettger's experience. He says he does not believe the organism persists in the herd from the time of first pregnancy; and from my experience I would substantiate that statement.

I believe most of us would agree with Dr. Fitch in his statement that we should consider all abortions as indicating the presence of the disease, and take the necessary precautions—not to depend upon laboratory methods alone for the control of this disease.

Now, in regard to Dr. Giltner's paper, the first item he points out is the necessity for education. I had a rather amusing experience a short time ago. I had been talking to a bunch of farmers about hog cholera. At the end of the meeting they brought up the subject of contagious abortion, as they usually do, and one said: "Isn't it true that the pure breeds are more susceptible than the short horns?" I said: "No, I don't think so; the trouble is at the other end." (Laughter.)

That shows the ideas some of these men have, and it points out the necessity of our educating the farmers in regard to this disease.

Dr. Giltner believes we can accomplish much by taking up the work with the local practitioner and educating him. I think we have to thank Dr. Williams in that respect, because he has

been striving so many years in trying to educate the local practitioner, and in trying to get the local practitioner to educate the farmer in the care of these animals. Dr. Giltner has emphasized the reluctance of authorities to regulate this disease. They try to find excuses—we might use scriptural language, in which it says: "They all with one accord began to make excuses." I think it is more a lack of courage than anything else. We all understand the immensity of the problem, and don't know where to begin; and he brought out another point which I have found to be responsible for greatly disseminating the disease—that is, the dishonest selling of diseased cattle; and we never will get anywhere in the control of the disease until that practice is checked.

He quoted from one man who did not wish to take action until we had uniform regulations north, south, east and west. We are familiar with this situation, and have reviewed it from a countrywide standpoint. To have uniform regulations is absolutely impossible, because if any disease presents sectional problems it is this one. The range animals and the dairy animals live under very different conditions, and this has very much to do with the amount of abortion and its manifestations. So, the problems are largely sectional.

If I may I would like to state my own view in regard to this problem of the control of the disease. I think we will not get anywhere until we attack the problem as we have attacked Texas fever, foot-and-mouth disease, scabies and so on; that is, have the campaign directed by some central organizations—we have such in the Bureau of Animal Industry—and have them to assign problems to the various sections, and have them worked out locally; and the Bureau of Animal Industry is in a position to assemble all this information and digest it and put it out in such form that it is available for the use of all. Then we will be making progress. We will conserve the efforts of those working with us; and in no other way can we hope to do anything along systematic lines. (Applause.)

DR. SCHROEDER: I wish to ask Dr. Fitch whether he has ever failed to get reactions in animals in which he has actually demonstrated the presence of abortion bacilli? My reason for asking this question is that I have long believed that one of the first steps in the control of abortion disease is the exclusion of all reacting cattle from uninfected herds.

Biological tests for abortion disease, it seems to me, are often criticised adversely because of a misconception regarding the

kind of information we may expect from them. No complement fixation or agglutination test, no tests with products like tuberculin, mallein, abortion, etc., can be regarded as a means through which we are enabled to forecast the future of an individual animal. The tests are not prophetic; they inform us that a definite but often concealed event has occurred, an event which may have a superlatively important bearing on the degree of safety with which the tested animals may be permitted to associate with other members of the species. Positive reactions with abortion tests mean that an animal has been attacked by abortion bacilli; they do not mean that an animal has aborted or will abort, any more than a typhoid fever test means that the tested person will shortly have symptoms of typhoid fever, or will die from a perforated bowel, or some other condition at times associated with typhoid fever. Taken for what they are actually worth, biological tests have a very high value, and are, moreover, amazingly reliable.

And now, while I am on my feet, as this is a general symposium on contagious abortion disease and I presume we are not obliged to confine our remarks to those phases of the disease to which the papers presented have called our attention, I wish to make a few remarks about a pamphlet on abortion disease which was recently sent me. The author of the pamphlet is Professor Williams, whom, I am pleased to observe, is present at this meeting.

The pamphlet in question is part of the "Cornell Reading Course for the Farm"; it bears on its face the high authority of "Cornell University," and it was published and distributed in accordance with an "Act of Congress," or, at the expense of the Government; and this pamphlet contains dangerously misleading statements which are at variance with the best obtainable data competent, reliable investigators on abortion disease have supplied us. I will read you several paragraphs contained in the pamphlet, and I wish to ask Professor Williams on what specific evidence he bases the statements made in these paragraphs. It may be that he has newly discovered evidence which he is ready to give us. Beginning at the bottom of the fourth page (page 164) is the following:

"This infection does not spread readily by ordinary contact, except in the case of scours and pneumonia in newborn calves. A cow may abort or have retained afterbirth and be kept in close contact with pregnant or non-pregnant cows without known

danger. For all practical purposes, the disease is spread, so far as is known, almost, if not wholly, at two periods: when the calf is in the uterus or during the milk-feeding period after birth; and during copulation between adults. The first of these periods is the more important. In the unborn calf, the infection passes from the uterus of the cow through the afterbirth, reaches the fluid in which the fetus floats (amniotic fluid), and is swallowed with it. After birth, the infection is swallowed with the milk. Apparently the infection promptly reaches the genital tract of the calf and remains there until breeding age, when it may cause abortion during the heifer's first pregnancy."

I have studied the available evidence pretty thoroughly, and have failed to find data to prove that copulation is responsible for the communication of abortion disease from animal to animal. Calves from infected cows may react with abortion tests, and may actually be infected with abortion bacilli; but, the reactions are passive in character, and, after their decline, there is no evidence to prove that abortion bacilli have remained in the bodies of the calves.

Another paragraph in the pamphlet reads as follows:

"The infection that causes the loss in the pregnant cow, whether in the form of abortion, premature birth, or retained afterbirth, is present in the cow's uterus when she becomes pregnant. Either it was in the uterus when she was bred to the bull, or it was introduced by the bull during copulation. If the uterus and the cervical canal, or mouth of the womb, are healthy when pregnancy occurs the uterine seal is formed very promptly, firmly closing the canal so that infection cannot enter. So far as is known, a pregnant cow or heifer cannot become naturally infected in the uterine cavity after the uterine seal has formed."

The farmer, not the veterinarian, or the bacteriologist, or the man technically trained to judge for himself, is informed that the infection swallowed by the calf promptly reaches the genital tract and remains there until breeding age, and then may cause abortion during the first pregnancy. On the same page he is informed that "Either the infection was in the uterus when the cow was bred or it was introduced by the bull during copulation." That is to say, if the cow swallows the infection, contrary to what promptly occurs in the calf, the uterus is quite safe.

Those who know that rapidly increasing evidence tends more and more strongly to prove that the commonest mode of infection in abortion disease is the ingestion of abortion bacilli during the period of pregnancy, and that pregnant cows above all others should be protected against food and drink contaminated with abortion bacilli, will realize that it is dangerously misleading to teach farmers that the time of infection is limited to two periods, "calfhood and copulation," and that it is even more dangerous to teach farmers that "a cow may abort or have retained after-birth and be kept in close contact with pregnant or non-pregnant cows without known danger."

There are other statements in the pamphlet which are equally objectionable, but I do not wish to impose longer on your time. I do wish to say, however, had Professor Williams published his curious, inconsistent hypotheses in a technical journal, or had he presented them to a body of trained veterinarians, I, for one, would not have said a word about them. But I do not feel that we can ignore the distribution to farmers of misleading and dangerous matter at Government expense and with the seeming indorsement of a great university. I would be glad to hear from Professor Williams if he has discovered new evidence which justifies his conclusions, and which is contrary to the data supplied us by world-famous men like Bang and Stribolt, Stockman and McFadyean, Mohler, Preisz, Zwick, Poels, etc., etc.

DR. W. L. WILLIAMS: Gentlemen of the Association, I plead guilty to have written Lesson 131.

Lesson 131, Contagious Abortion of Cattle, is a part of the Cornell Reading Course for the Farm. The writer was requested by duly constituted authority to prepare the bulletin, or lesson, and it was published and distributed under authority of the Act of Congress of May 8, 1914.

I think if there is any disease of animals upon which one can be readily misunderstood it is contagious abortion. I believe I have been misunderstood every time I have spoken or written a word on contagious abortion, and I don't think any man has misunderstood me more continuously from beginning to end than Dr. Schroeder.

In this publication I was asked to express my own opinion and not the opinion of anyone else. I have the peculiar habit when I am asked to express my opinion of confining my expression to the opinion of W. L. Williams, and giving it in as exact

words as I can, and then standing responsible before the profession for the opinions expressed.

DR. J. W. CONNAWAY: Mr. Chairman, I had it in mind when I came to this meeting to invite both Dr. Schroeder and Dr. Williams out to Missouri at our Farmers' Week, to talk to the farmers (laughter). But how to prevent discussions like this we have had here today before those farmers would be the problem. I feel that they all realize that the control of this disease is a great problem. I feel, like Dr. Schroeder, that it is very important to educate the farmer and give him something plain and simple, that he can put into practice, something that he can do; and, on the other hand, teach the veterinarians the influence they can exert, and let each man do his own job the very best he can; and by this kind of coöperation I think we can make great progress in the control of this disease.

I regard Dr. Schroeder as one of our safest scientists in this matter of contagious abortion, and I regard Dr. Williams as one of our ablest surgeons. If he would stick simply to the sterility problem and try to overcome those things that produce sterility, and to teach—I have told him, in a private conversation, that one of his great functions, as I see it, is to be a sort of specialist, to go over this country, to teach the practicing veterinarians, or groups of them if we can get them together. I will get fifty of them together this winter if he will come out and teach those men something of the manipulation; and also teach them that it requires experience, that they probably cannot go right out at once and do this thing perfectly—and he told me they could not—but to impress on them that it is a matter of experience.

Now, these two things go together, sterility and abortions. They are not necessarily associated, in my opinion. Retained afterbirth and infection of that uterus—the after results may leave a chronic metritis that will leave that animal a sterile animal. Here comes in the work of the local veterinarian, who ought to be on the job and clean up that cow in the right way, so as not to have her become sterile. This is a surgical procedure, an important surgical procedure. It ought to be done whether that cow has had contagious abortion or not.

Now, leaving this for a moment and taking up the work reported by Dr. Fitch, I believe that Dr. Fitch left the impression on this body that in a practical way we could not get very much help out of these tests so far as the control of contagious abortion is concerned. I hope you will not go away with such an impression.

He may not have meant to give you that impression, but that is the sort of impression I got in listening to him; and it is the impression, I think, farmers would get if they had listened to this presentation of the test for contagious abortion. Here are so many conflicting things that mix the farmer up. The farmer wants to know why. Now, in my work I have probably one hundred—possibly one hundred and fifty—herds on test, comprising probably six or seven thousand head of cattle that we have tested for contagious abortion at the request of men who suspected they had the disease in their herds. In some of these herds they were negative. In other herds, by far the larger number, they were positive. We expected this, because the men usually do not come for help unless they have had several abortions.

In this work we have had pretty much the same record, in our records, as were shown by Dr. Fitch. We find that cows that breed regularly sometimes will show a persistent positive reaction; and in that same herd we will find other animals that show persistent negative reaction and are regular aborters; but in our work we have not found, except in very exceptional cases, any of those negative reactors casting calves. I have found it a very valuable aid in cleaning up those herds.

I believe that every agricultural college ought to be doing this work for their farmers and breeders, and be helping the veterinarians in their work. I know in some herds it has given positive results in helping the man to clean up in this work. I think that over a period of three or four years ought to be sufficient time for us to judge the practical value of this test, and I am quite sure it will prove of great good.

Now, as to the explanation of some of these varying results. Sometimes a cow will abort, and you don't get a reaction. The farmer wants to know why. I had one of these cows which aborted, but we have her as a chronic negative. Some other farmers may say, "I have a positive cow but she has not aborted." He expects every one that shows positive reaction to abort. If we put a large amount of our data together and compare it with the experience of other men who have gone before in this work, we can philosophize in this way and explain matters. It will explain these tests and the nature of infection.

If we compare this with the hog cholera, for instance, some experiments we have made show the infection of hog cholera will persist in the hog for fifteen or twenty days after the injection

into those animals—I mean in a hog that has been vaccinated with the simultaneous treatment and shows no clinical symptoms of illness. You can cut off the end of the tail of that hog, draw the blood of that hog and inject it into another hog and give him the disease.

In the case of tuberculosis, the tuberculosis germ flows quite freely through the blood, and especially in advanced cases. We have proven this by drawing blood from animals infected, and injecting it into other animals, introducing the disease. Hogs show it quite readily.

Other work along this line has been quite negative, because they used guinea pigs and rabbits, into which you could not inject a large enough amount of blood to bring about reaction. But take a hog which has had tuberculosis and cut off the end of the tail of that hog and inject half a liter or less, 200 c.c., and we have reproduced the disease from the circulating blood drawn from the animal in that way.

Now, as to contagious abortion, this is not a disease, as Dr. Schroeder has told you (that is, topically), that confines itself to the genital organs at all. By preference it localizes itself in other organs of the body, preferably the udder. I did not believe that, Doctor, when you published that, but I found out you were right. And in other glands of the body they have found it. Possibly they have found it localizes itself in other parts of the body which Dr. Schroeder did not discover. So here we have an infection which is localized away from the tissue. Then we have all these bacilli out of their usual habitat, in the general circulation and in other organs. I have here some case reports—

PRESIDENT TORRANCE: Excuse me, Dr. Connaway. I believe I have been guilty this afternoon in allowing the discussion to depart from the usual rule of five minutes to each man. The discussion has been very interesting, but I will ask Dr. Connaway and those following him to adhere to that rule.

DR. CONNAWAY: I will close in a very few moments. The man believed he could infect by feeding, by injecting into the vagina, and by injecting intravenously. We have repeated those experiments and checked up with the complement fixation test. Our inbred heifers were tested and found negative. We bred these heifers and later on fed two with the germs, some from the Wisconsin laboratory, some from the Washington laboratory and some our own mixtures; all these we have fed, and in the

course of a few weeks we have produced the reaction. By testing the blood of those we can get the reaction, by feeding. In two we injected hypodermically. In about thirty days, and after two injections, we got the reaction there. One of these cows dropped her calf prematurely, in a couple of weeks. The other kept it up until the full term. And these were injected late in the pregnancy and not early.

In another we injected vaginally. This cow reacted. There was absorption of the bacilli, or at least, of the products, that gave a reaction in this one. This animal was too close to calving time to produce an abortion.

In all these cases, however, the calves came at least a week or ten days earlier than the normal time.

Two other cases were injected, two pregnant heifers that were negative before the experiment were injected, into the tests. In one the right quarter and in the other the left quarter, and both of these aborted. The complement fixation tests were positive. One dropped her calf over a month early, and the other carried her calf to the full term, and both calf and cow reacted to the test. Every cow responded to the experiment by the complement fixation test.

Dr. Williams contrasted natural infection with experimental infection. We know that the growing of these germs in the laboratory attenuates them, and that we should not expect the same degree of infection as we would have from a natural infection. This explains the difference. (Applause.)

DR. EICHHORN: I don't think that there is any disease occurring in animals in which we have as great a confusion as in contagious abortion. We have had many symposiums and many publications and addresses, yet from the experience this afternoon there is no doubt that we are just as much in the dark on many phases of this disease as we have been in the past. Some years ago the same condition prevailed in regard to the diagnosis of the various phases of glanders. The Association at that time thought it even advisable to appoint a special committee to study glanders and especially diagnosis of the disease. This committee took up the various phases of the work and reported to the Association after two or three successive years, and it was considered a finished work; and even today I believe it is considered by the country to be standard.

Now, I think that should be done in regard to contagious abortion. The papers here have no definite conclusion. I move

that such a committee be appointed, and I am quite sure by following this method we will get further in the study of this disease.

DR. HART: I should like to second all that Dr. Eichhorn has said. It seems to me there has never been a time when we should have a clearer understanding than we have in regard to this disease. It is clear as between Dr. Schroeder and Dr. Williams one is talking in the light of clinical detail, and the other man more or less generally. Bang's disease is caused by only one thing, and it is caused by the bacillus Bang. And I think that Dr. Schroeder's point of view and Dr. Williams' point of view are suspended around that; and I think the matter could be cleared up by the appointment of a committee as proposed by Dr. Eichhorn, and I second the motion.

PRESIDENT TORRANCE: It has been moved and seconded that a committee be appointed to report on contagious abortion.

DR. WILLIAMS: It seems to me that there comes a time in the building up of our knowledge of any disease that a committee such as that which has been proposed is appropriate and highly advantageous. At present I do not think we have reached that stage of development. I think personally that as many workers as possible should be induced to enter the field, and they should work perfectly free and unhandicapped; and that when they have reached certain conclusions and have obtained certain data that the data and conclusions should be published, and that in the formative stage of our views regarding a certain disease or group of diseases the greatest possible freedom should exist. I do not feel that this Association, or our knowledge of the subject of contagious abortion, is put back one particle by the difference of opinion existing between Dr. Schroeder and me. I think it a privilege and an advantage that Dr. Schroeder should express his views, and that I should express mine. Certainly there is no personal feeling on my part. I don't believe there is on Dr. Schroeder's part. And I believe Dr. Eichhorn might put us into the same room, with a knife, perfectly safely. I, for one, feel that it would be exceedingly unfortunate to put Dr. Schroeder and me upon a committee and compel us to come up here and speak in hearty accord. I don't believe it would be right to Dr. Schroeder or to me. I believe we should have the right to heartily disagree and not feel badly over it, and when we get through with this discussion and are in a position to come together and form some definite plan of action, then I should be glad to meet Dr.

Schroeder. So, it seems to me the time has not yet arrived. If there is any one particular point upon which some opinions are being formulated, then I think it very well; but to turn such conflicting views loose and then try to bring them together in a report I think would be very bad. If Dr. Schroeder and his honorable colleagues who agree with him are made the committee the report would be unsatisfactory to some other people. If I should be made chairman of that committee you all know it would not be satisfactory to Dr. Schroeder.

DR. H. P. HOSKINS: If I remember Dr. Eichhorn's motion correctly this committee was to be appointed for the purpose of getting the best methods of diagnostic work.

DR. EICHHORN: For the best study of it.

DR. H. P. HOSKINS: The United State Live Stock Sanitary Association has such a committee, and their report, I believe, was presented at Chicago, and I believe the report has been published. Why duplicate?

DR. EICHHORN: This is to extend over many years to come, not one year. The object would be to sift down all the work that has been done, and which has thrown additional light on our knowledge, and which can be presented to the Association, so that the members can receive the report here of the committee and will not have the confusion they have at the present time.

DR. W. H. HOSKINS: I have listened to these reports for hours, and when a man requires hours to present a paper, it shows we do need more knowledge on the subject. I hope the motion will prevail.

(The motion was put to a vote by the President, who stated that presumably the report will not be asked for before the next meeting of the Association, next year. The motion was carried.)

PRESIDENT TORRANCE: Is it desired that the President should name this committee, or does the Association desire to nominate the members of it?

DR. W. H. HOSKINS: I move that the Chair appoint them.

(The motion was seconded and, on vote, carried unanimously.)

PRESIDENT TORRANCE: Well, I would nominate Dr. Eichhorn, and as his colleagues Dr. Schroeder and Dr. Williams and Dr. Fitch, with power to add to their number—and Dr. Ward Giltner.

DR. WILLIAMS: I wish you would appoint Dr. Kinsley in my stead. I feel I should withdraw.

DR. KINSLEY: I hope to live more than one year.

DR. EICHHORN: I move Dr. Schroeder be made the chairman of the committee instead of me.

DR. SCHROEDER: I wish you would not put that motion.

PRESIDENT TORRANCE: I feel it would be quite inadvisable to let Dr. Williams retire from that committee. I think the presentation of his views would be most valuable, and with Dr. Schroeder there to criticise we should be sure to arrive at the truth. I think I will let the committee stand as appointed.

THE PRESENT STATUS OF SPECIFIC TREATMENT FOR CONTAGIOUS ABORTION.*

H. PRESTON HOSKINS, V. M. D.,
Research Laboratories Parke, Davis & Co., Detroit, Michigan.

It is now over twenty years since Bang¹ announced the discovery of the causative organism of contagious abortion of cattle. The identity of the organism responsible for the same disease in this country, with that of the European organism, was established by MacNeal and Kerr², in Illinois, in 1910. These discoveries stimulated many investigators to attack the problem of finding some remedy or agent for the prevention or cure of the disease. Naturally the search for such an agent was in two directions, viz., medicinal and biologic. This paper will deal only with the latter, although it might be stated, in passing, that up to the present time anything in the way of a chemo-therapeutic agent of real merit is much of the nature of a chimera.

The fact that the behavior of contagious abortion in a given herd, when not interfered with by the hand of man, suggests that a rather high degree of immunity is established after a succession of abortions, has led to experiments to produce such an immunity artificially. The agents used have been products prepared from cultures of the abortion organism, almost without exception. Most of the work on which reports are available has been done with killed culture of *B. abortus*, so-called abortion bacterins and vaccines.

Various methods have been used in the preparation of these vaccines. The dosages recommended by the purveyors of these products show extreme variations, from what appears to be a rather low dosage to what is considered a high dosage (from

*Read before the Southeastern Michigan Veterinary Medical Association, Detroit, Michigan, January 8, 1919.

85 billion to 1000 billion organisms). The number of injections advised is equally inconsistent, some advocating three, some four and some six treatments. The intervals between injections show the same wide variation. In fact, the practitioner can at present choose just about what he wants to suit his own convenience in the matter, or his preferences, if he has any. If he has to take into consideration the size of his bill, or his client's pocketbook, he can select anything from a course of treatment costing 75 cents to one costing \$2.00 per animal. To the best of our knowledge there is no publication available which gives directions for varying the dosage or the intervals between injections to meet local or individual conditions. Further, it might very properly be argued that the very reason why there is such a wide variation in the matter of recommended dosages is because none of the dosages employed has given uniformly good results.

At the recent meeting of the United States Live Stock Sanitary Association, held in Chicago in December, Dr. Williams very severely criticised certain biological manufacturers for continuing to market contagious abortion vaccines, in the face of the practical unanimity of opinion of competent authorities to the effect that such products were just about worthless. "No-cure-no-pay" propositions of various concerns came in for their share of censure at the hands of Dr. Williams, as well as the misleading advertisements of others. A great deal of credit was and should be given Dr. Williams for his courage in taking the stand he did. The evidence available certainly justifies his attitude.

For the purpose of getting the consensus of expressed opinion of various authorities on the value of contagious abortion vaccines, the writer has examined all recent reports and publications available. Care has been used to select only the most recent of these papers and reports for abstracting opinion, so that the resumé can be said to consist only of the very latest and up-to-date ideas on the subject. Besides this evidence, an opportunity has been afforded to examine a large number of reports on the use of contagious abortion vaccine experimentally. Many of these reports are valueless from a truly scientific standpoint, owing to the lack of care used in keeping accurate records and making final reports.

It is only fair to state that in quite a number of cases the outcome of the treatment was reported as "favorable" or "satisfactory," in the judgment of the owner or the attending veterinarian. Except in rare cases, no cows were left untreated as

controls in the experiments reported. Equally rare was a complete herd history. In many instances all the animals in certain herds were treated alike, virgin heifers, heifers in calf for the first time, mature cows, suspected aborters, known aborters, non-breeders, etc. Even under the best of conditions it is not often possible to get complete data upon which to base a fair estimate of the results of the treatment. Such cases do occur, however.

To show how easy it is for one to be led to believe he is getting desired results from a certain treatment, an instance will be cited which is illustrative, and at the same time rather amusing. A veterinarian wrote in to obtain some contagious abortion vaccine. The requisite number of treatments of our experimental product was forwarded. The vaccine was for bovines and so labeled. In due course of time a report on the outcome of the treatment was solicited. We were informed that the vaccine had been used on eleven mares, no abortions followed, and naturally the vaccine received credit for 100% success. Although this might be used as an example of non-specific therapy, we rather incline to the belief that it was a case where nature was not given the credit due her, but was overlooked because the vaccine had been used. Salt solution would probably have been just as efficacious in this particular case.

Some veterinarians deserve to be censured for the attitude they take on this question. Fortunately, known cases such as the following are few, but they do exist nevertheless, and should be frowned upon whenever encountered, certainly not encouraged. Dr. A. is asked to advise a client how to proceed to rid his herd of contagious abortion. He elicits from his client the information that the disease has existed in the herd for a year or more. Dr. A. has used contagious abortion vaccines in several herds with questionable results. At the same time he is aware of the irregular results reported by fellow practitioners. However, he advises his client that vaccination is indicated. When asked why he adopted this course, his explanation is somewhat as follows:

"Well, in the first place, I had to recommend something. From the history of the herd, I was of the opinion that the worst was over, and that probably there would not be many more abortions. I did not advise vaccination because I thought vaccine would clean up the herd. Between you and me, I don't believe the stuff is any good, anyhow. But I knew that if I did not vaccinate that man's herd, Dr. B. would, and there you are. I had to do something."

Manufacturers have been accused of making false claims for contagious abortion vaccines, thereby creating a demand for them, and, having created this demand, they feel fully justified in meeting it, very much for the same reason that Dr. A. treated his client's herd. Manufacturer X says that if he does not sell Dr. A. contagious abortion vaccine, his competitor will. In the case of this particular product it cannot be said that the demand comes as a result of the publication of work indicating that the product is valuable or has merit. At the present time the line is pretty sharply defined between those who publicly support the vaccine method of treatment and those who do not. On the one side we have those whose vision is dimmed by commercialism, while, on the other, we have men who have spent years in investigating and observing, and are in positions to give opinions that are free from bias and prejudice. These opinions are numerous and come from some of the very best men in the veterinary profession today.

There are a number of points that must not be lost sight of, if we wish to give a fair interpretation of the results obtained following the use of contagious abortion vaccine.

1. In the great majority of cases the vaccine is resorted to only in the declining phase of the trouble in a given herd.

2. Abortion disease is frequently a complicated pathological condition, and the number of abortions in a herd does not always tell the whole story.

3. Undoubtedly there are local conditions which play a prominent part in lessening or increasing the severity of the disease, regardless of artificial interference, and for this reason it is difficult to evaluate properly the results obtained by our present hit-or-miss, go-as-you-please methods.

Some rather questionable statements are found in the advertising matter distributed by certain laboratories. Frequently such statements are not accompanied by any experimental data to substantiate them, nor any references to such data. As an example, we will quote a paragraph from a circular on the subject of anti-abortion vaccine, viz: "The British commission reported that in instances where live cultures were used, the results were successful, but were of little or no avail if cultures were heated. Anti-abortion vaccine is prepared from a large number of strains of the bacillus of infectious abortion, isolated from widely scattered sections of America. *The organisms are killed without the aid of heat, which makes them practically as*

beneficial in producing immunity as though live cultures were used." I seriously question this statement.

Reference has been made to the opinions expressed by competent authorities on the value of vaccines. The annual report of the State Veterinarian of Nebraska³, for the year 1918, contains the following general statement concerning contagious abortion and sterility, and the remarks on vaccine treatment are illustrative of the present trend of opinion:

"The way to guard against the disease is by prevention and sanitation. Be careful when buying new animals to be placed in the herd. There are no drugs which are of any value in the treatment of this disease except antiseptics. Carbolic acid, methylene blue and some other drugs, which some claim have proven useful, are, in fact, of no value whatever. Anti-abortion bacterins have been put on the market and are being advertised extensively, but the manufacturers have as yet not been able to prove their value. Excepting the claims made by the biological houses, which they seem to be neither able nor willing to substantiate, there is no evidence whatever to prove that anti-abortion bacterins are worth anything. The best that can be said about them is that they are still in the experimental stage. This does not mean that they will never be perfected to a high degree of usefulness, such as other biological preparations have been developed, but until such time it would be folly to depend on their use in the prevention of the disease, and it would be money wasted to buy them."

A recent bulletin from the North Dakota Agricultural Experiment Station⁴, on the subject of abortion disease in cattle, contains the following paragraph:

"The fact that after abortion a certain degree of immunity is apparently established, combined with the success acquired through artificial immunity in a series of other diseases, is responsible for various attempts to control abortion disease by rendering the animals refractory to it by similar methods. In this country very little work has been done in the direction, partly, no doubt, because until the last few years the seriousness of the disease was not generally recognized. A far greater alacrity, however, was exhibited by the commercial interests who for some time already had flooded the market with a great number of so-called bacterins or supposed immunizing agents, claimed to have a great value in the prevention of a considerable assortment of diseases. The opportunity offered by the now well-advertised abortion disease was not wasted by those interests, and bacterins are now on sale, accompanied by even more or less spurious 'guarantees.' Those and similar bacterins consist of suspensions of killed bacteria and hence they are probably en-

tirely harmless. Their usefulness may, however, be questioned in the absence of well-controlled experiments and observations."

McFadyean and Stockman⁵, in commenting upon the results of experiments with "bacterin" treatments, state that the influence of the killed cultures was practically negligible, and their published data certainly bear out this conclusion.

In a paper by Drs. Adolph Eichhorn and George M. Potter⁶, read before the American Veterinary Medical Association, in this city, August 22, 1916, and published in the *Journal of the Association*, the following reference is made to the use of bacterins:

"Immunization with abortion bacterins is now being widely advocated by manufacturers of these products. The results obtained do not warrant the confidence which is expressed in the literature and advertising matter. Considerable experimental work has been conducted by the Bureau of Animal Industry on the effectiveness of bacterin treatment, and, while the results were somewhat encouraging, nevertheless generally good results cannot be claimed for such a procedure. In view of our findings, and also those of other investigators, the claims for the bacterins are unwarranted, and will not serve any good purpose in the control of the disease. Veterinarians will be prone to accept the statements made by the manufacturers at their full value, and possibly disregard other effective means by which the disease might be combated. It is possible that further investigations will establish a more effective method of immunization, but at present the bacterin treatment should be regarded as second in importance to proper sanitation."

Speaking from the standpoint of a practitioner, Dr. Cotton⁷ states as follows:

"Until we have something more positive in the line of immunization by vaccination, I am of the opinion that we, as practitioners, should not undertake to build up false hopes in the minds of owners of our herds throughout the country, by the use of the various vaccines that are now on the market."

In an article treating of abortion and its sequelæ, Dr. C. C. Palmer⁸ of Delaware College speaks of his experiences as follows:

"We have tried a system of vaccinating (by means of sero-bacterin) all new-born calves, but the results so far have been disappointing. Many of the calves seem to do well until two or three months of age, when they invariably develop scours and pneumonia. Further treatment with vaccines or serum was unavailing."

"Biological products for the control of calf diseases should be regarded as being in the experimental stage, and at the present

time our chief hope lies in the proper hygiene of these young animals. Vaccines and serums may be tried, but the hygienic factor should not be lost sight of."

I am personally familiar with the work that has been done by Dr. W. L. Boyd, at the University of Minnesota, and the following paragraph from the 25th annual report of the Agricultural Experiment Station, University of Minnesota,⁹ is merely an illustration of the results obtained in large numbers of experiments:

"Thirty-two young heifers were given a series of injections of large doses of killed abortion bacilli. The results so far obtained indicate that this method of vaccination is not satisfactory for the prevention and control of infectious abortion."

The opinions of Dr. Williams on this subject are so well known that they need little comment. However, in a recent publication¹⁰ he states:

"The administration of bacterins, vaccines or sera to the pregnant animal has been advocated, but these have failed. Like antiseptics, they fail to reach the location of the harmful infection in the uterine cavity. Their failure does not prevent some establishments from advertising and selling their products."

It should be distinctly understood that practically all of this adverse criticism has been directed against contagious abortion bacterins and vaccines consisting of dead organisms, whether they be killed with or without the application of heat. The use of vaccines containing living organisms is being turned to just now, in the hope that they will give a better account of themselves. The work of the English Commission and of Bang, in Denmark, is referred to in this connection. Experiments on a small scale are now being conducted in this country, and the results will be awaited with interest. It will likewise be of interest to note what the attitude of sanitary officials will be as to the distribution and use of the living vaccine. That it is a procedure attended by a certain amount of danger goes without saying.

The disadvantages of employing live bacilli are enumerated in a recent bulletin prepared by Dr. F. B. Hadley¹¹ of the Wisconsin Agricultural Experiment Station. They are as follows:

- (1) Rapid deterioration of the vaccine.
- (2) Slow development of immunity.
- (3) Temporary discomfort to the animal.
- (4) Danger of introducing the infection.

Of these objections, the second, the slow development of immunity, will probably be the most difficult to overcome. This is no fault of the vaccine, but is due to the very nature of the disease. It is always a more or less chronic infection. Practically without exception, those diseases which are successfully controlled by vaccination are the acute infections, such as blackleg, hog cholera, anthrax, hemorrhagic septicemia, and rinderpest, while such chronic diseases as tuberculosis and glanders have not been amenable to prophylaxis by any system of vaccination.

When we speak of immunity in contagious abortion it is not exactly clear what we mean by the term. Our laboratory tests that indicate a positive reaction tell us little of value in the case of the individual animal. An animal reacting positively to one of these tests today may abort tomorrow, or she may carry her calf to full term, and subsequent pregnancies may be terminated just as successfully. The future of these calves, however, is another matter.

This paper would not be complete without some mention of the use of a specific anti-serum. Some experimental work has been done with this product, but, again, the nature of the disease is such that the extensive use of the serum may never come about. When used as a prophylactic, the immunity afforded probably does not last over three weeks, necessitating a repetition of the treatment every three weeks until pregnancy is terminated. This method of treatment is too expensive, except in the case of extremely valuable animals.

As a curative agent the serum is again of little use, as far as the cow is concerned, on account of the nature of the disease. The abortion organism is rarely the cause of the death of the cow. If there are any complications following an abortion they are usually not due to the abortion organism, and therefore an abortion anti-serum is not indicated. Investigations would seem to indicate that the abortion organism is responsible for some of the common calf diseases, notably white scours, calf pneumonia, arthritis (navel-ill), etc. Therefore, a serum directed against this organism is indicated. However, there are other organisms which are just as likely to be implicated in these conditions, most important of which is the colon bacillus.

It is the practice of some laboratories to include the abortion organism in the antigen used for the production of white scours serum. We carried this idea even further and prepared a serum using equal amounts of abortion and colon organisms in the

antigen. This was used on herds where both white scours and contagious abortion existed. Clinical reports indicated that the results obtained with this combination serum were no better than when the regular white scours serum was used, and we decided to let well enough alone.

In closing, I would like to call your attention to a recent publication on the subject of the etiology of contagious abortion of cattle. If the findings of Dr. Theobald Smith¹² of the Rockefeller Institute, Department of Animal Pathology, are verified by other workers in different parts of the United States the least that can be said is that the question is more complicated than ever.

Dr. Smith has recently described an organism, a spirillum, which he has isolated in pure culture from the foetuses of fourteen cases of abortion. The abortions occurred in a group of herds, under the same management, and during the investigation, which lasted over a period of about fifteen months, there were twenty-seven abortions, in which *B. abortus* of Bang appeared to be the etiological factor.

One of the most interesting facts brought out by the investigation is the absence of *B. abortus* in those cases where the spirillum was found and the absence of the latter when *B. abortus* was present. That the two organisms are not identical is shown by the lack of pathogenicity for guinea pigs, on the part of the spirillum, besides difference in morphology.

On the other hand, there are a number of points in common. The spirillum is evidently an organism that demands a reduced oxygen tension for successful artificial cultivation, and it has been found that it may be isolated in pure cultures from foetuses under precisely the same conditions as *B. abortus*. Both organisms have been found in the gastro-intestinal tract, as well as the respiratory tract of the foetus, quite regularly, but less frequently in the other organs. Both organisms have been found in the placental fluids.

For some unexplained reason the spirillum has not caused an abortion during the first pregnancy of any cow, but in all cases in which the spirillum has thus far been demonstrated the abortion has occurred during a second or later pregnancy. No inoculation tests have yet been made owing to a lack of suitable subjects. It is desirable—in fact, essential—that experiment animals used in the crucial test should be perfectly free from infection, with either Bang's bacillus or the spirillum, and they should likewise be free from any immunity to these infections gained by

exposure to them. Serological tests have been delayed, owing to the difficulty of getting the organism to grow satisfactorily on artificial media not containing blood or tissues.

If subsequent investigations show that the new organism is capable of producing abortion, as does the Bang bacillus, it is difficult to predict just what effect it will have on our present methods of handling the abortion problem. The next step will be for other investigators, in different localities, to try and confirm the findings of Dr. Smith. The fact that abortions among sheep and cattle in Ireland and Wales have already been reported as due to organisms similar to the spirillum is quite suggestive of the widespread character of the infection. Are the irregular results that have been obtained with bacterins made from *B. abortus* due to the fact that this organism was not operating in a certain percentage of the cases?

CONCLUSIONS.

1. The consensus of opinion, as expressed by recognized authorities, is to the effect that vaccines and bacterins made from dead abortion bacilli are of no real value in the prevention, cure or control of the disease.

2. Such preparations are probably harmless, in so far as any danger to the treated animals is concerned, but they may possess a potential danger by causing veterinarians to overlook other methods for handling the disease.

3. If veterinarians wish to make and preserve a reputation for being careful observers, scientific workers and ethical practitioners they should keep in mind the nature of this abortion disease and its sequelæ, treat it accordingly and endeavor to interpret results intelligently, at all times holding themselves aloof from any connection with the so-called "no-cure-no-pay" propositions.

4. Experiments with vaccines consisting of living organisms are apparently more encouraging, according to the work thus far reported. If a stable product can be prepared, for use under actual conditions, and a safe method of distribution and administration devised, the product may prove to be of considerable value in the control of the disease.

5. The use of anti-abortion serum is rather limited, owing to the nature of the disease. Theoretically, its employment in certain conditions is perfectly rational, if the value of the cow or her progeny warrants the expense.

6. Some clinical observations would suggest that the colon organism is more important, the common diseases of the new-born calf, than *B. abortus*, even though the latter is found in some cases of scours, pneumonia, arthritis, etc.

7. Our problem may be further complicated if the researches of Dr. Theobald Smith are confirmed, and it is shown that there are two organisms, instead of one, responsible for the abortions so prevalent among our cattle.

REFERENCES.

- ¹ Bang, B. The Etiology of Epizootic Abortion. *Jour. of Comp. Path. and Therap.*, X (1897), p. 125.
- ² MacNeal, W. J., and Kerr, Josephine E. *Bacillus Abortus* of Bang, the Cause of Contagious Abortion in Cattle. *Jour. of Inf. Dis.*, VII (1910), 3, pp. 469-475.
- ³ Anderson, J. S. Annual Report of the State Veterinarian of Nebraska (1918), pp. 119-120.
- ⁴ Van Es, L. Abortion Disease in Cattle. North Dakota Agricultural Experiment Station, Circ. No. 18 (1918).
- ⁵ McFadyean, J., and Stockman, S. *Epizootic Abortion in Cattle*. London, 1909. Report of the Departmental Committee Appointed by the Board of Agriculture and Fisheries to Inquire into Epizootic Abortion.
- ⁶ Eichhorn, Adolph, and Potter, George M. The Present Status of the Abortion Question. *Jour. A. V. M. A.*, 3 (1916), pp. 295-307.
- ⁷ Cotton, Chas. E. Contagious Abortion from a Practitioner's Standpoint. *Jour. A. V. M. A.*, 3 (1916), 1, pp. 12-23.
- ⁸ Palmer, C. C. Some Observations on Abortion and Its Sequelæ. *Veterinary Alumni Quarterly*, VI (1918), 1, pp. 122-131.
- ⁹ Thatcher, R. W. 25th Annual Report of the Agricultural Experiment Station, University of Minnesota (1917), p. 53.
- ¹⁰ Williams, W. L. Contagious Abortion of Cattle. Cornell Reading Course for the Farm, Lesson 131.
- ¹¹ Hadley, F. B. Contagious Abortion Questions Answered. *Agr. Exp. Sta.*, University of Wisconsin (1918), Bulletin 296.
- ¹² Smith, Theobald. Spirilla Associated with Disease of the Fetal Membranes in Cattle (Infectious Abortion). *Jour. Exp. Med.*, XXVIII (1918), 6, pp. 701-721.

HEMORRHAGIC SEPTICEMIA.

G. E. JORGENSEN,
Assistant State Veterinarian, Clermont, Iowa.

Hemorrhagic septicemia is and has for the past few years drawn the attention of the veterinary profession to a greater or lesser degree depending upon the locality. Here in this section of Iowa the disease is frequently met with. Although no species of animals appear immune to the disease, the only forms that I have encountered is the bovine and swine form.

Hemorrhagic septicemia is caused by a group of organisms known as the *Pasteurella* or *Bacillus Bipolaris Septicus* group. It is a non-motile, gram negative, rod-shaped organism, 0.5 by 1 micron in size, showing a tendency toward bi-polar staining. As far as known it produces no endotoxin, hence no antitoxin is produced. The immunity conferable is based upon an aggressin and consequent anti-aggressin production; at any rate, regardless of the basic constituents of the immune bodies, immunity is, and can be, artificially produced, as is shown both in the laboratory and in the field.

In the outbreaks that I have observed, it was of an intense bacteremia type, acute and of a rapid course, ending in death. The above statement refers to the bovine type only.

Autopsy of the dead animals revealed the characteristic petechia and ecchymosis, together with an albuminous degeneration of the parenchymatous organs, and in some, in which death was retarded, a mixed form of pneumonia was seen. I have as yet never seen a case of the cutaneous form, the forms seen being of a pneumo-enteric bacteremia.

Various forms of treatment of the sick animals have been tried, including sod. cacodylate and sol. iodine, bacterins and normal serum, but the treatment has been a waste of time in my experience.

Prophylactic treatment, however, has been followed by very successful and encouraging results. This is accomplished by subcutaneous injections of a sterile suspension of the killed organisms, together with their cultural products. A single treatment usually is sufficient. However, I have met with outbreaks in several herds where a second treatment was necessary.

It appears that this organism is the etiologic feature in a fatal form of pneumo-enteritis in young calves. I have observed such a condition in several herds, in which there was evidence of a chronic bronchial pneumonia, complicated with chronic enteritis, running a course of weeks, and even two months, ending finally in death. Autopsy of these animals shows a mixed condition of the lungs from congestion to hepatization, with a hemorrhagic or purulent exudate; the intestines showing a chronic hemorrhagic inflammation, the mucosa considerably thickened and, in some cases, ulcers were noted. Smears from these cases show a mixed infection. In the lungs I have found, besides the bipolaris organism, the usual respiratory flora of cocci, from strep to pneumococci and staphylococci. However, they are probably secondary invaders. In the intestines the bipolar organism was also seen, together with colon and other saprophytic organisms. Experimental inoculations of rabbits with material from these cases have invariably caused death in twenty-four to forty-eight hours, and the usual lesions of hemorrhagic septicemia observed on autopsy. Treatment of these cases has been unsatisfactory. However, here, again, injections of the killed organism into the well individuals of the herd has checked the spread of the disease.

The form encountered in swine has been usually of the pneumonic form chronic in nature and running in course from a few days to weeks. Some cases have shown intestinal lesions and several have shown an acute form, dying in a few hours and showing lesions of septicemia. By far the usual course, as stated above, was of a chronic nature, the symptomatology of which was a chronic cough on exertion, inappetence, emaciation and death. Autopsy showed a mixed pneumonia, of a bronchial and interstitial nature, with a fibrinous or purulent exudate and a fibrinous pleuritis. Bronchial and mediastinal lymph glands hemorrhagic. A simple pericarditis and an ulcerative endocarditis has also been seen in some cases, while in others a myocarditis has been seen. The balance of the organs show the usual lesions of a chronic infectious disease.

No treatment has been successful in these cases, the only procedure that seems of practical use being immunization. I have not had as good results with a straight bipolaris bacterin in these cases as I have had with a mixed bacterin containing a certain percentage of strepto, staphylo, and pneumococci, together with several strains of colon bacilli. Smears from the

lungs of dead animals show that there is always a mixed infection, hence the better results from the use of a mixed bacterin. As the lesions of a mild form of cholera are almost identical, when the kidney petechia are not present (and, as a matter of fact, when they are present as the writer has seen them in hemorrhagic septicemia that cleared up on vaccinating with that specific vaccine only), cholera is sometimes overlooked. This has happened to the writer and only a laboratory diagnosis showed the true state of affairs. It is in such cases that vaccination with the bipolar organism only does not give the results. In these cases the administration of the simultaneous cholera method will invariably stop the losses.

In conclusion, I will say that in the last few years we have learned a good deal about these infections, but there is still much to be cleared up before we can really say that we understand it in every detail.

THE SWINE DISEASE SITUATION.*

C. H. STANGE, Ames, Iowa.

There is no other subject confronting the practitioner that is more debatable or confusing at the present time than ailments of swine. There are reports from various parts of the country concerning new or heretofore unknown diseases, and veterinarians should be very careful in rendering a diagnosis in such cases, and especially in applying some specific name. Our conception of what certain specific diseases actually are necessarily undergoes a change from time to time, which leads to confusion rather than a clarification of the situation, unless based upon reliable and confirmed investigations.

With the possible exception of the condition called by some "Influenza of Swine," concerning which I have no definite knowledge either from a pathological or etiological standpoint, and which is not considered in this paper, I wish to point out that we have not met with anything new, neither have we found any pathological changes which have not been observed for the last thirty-five or forty years. We are simply obscuring our own vision and allowing ourselves to be misled into paths of confusion and bewilderment by accepting every proposed new classification or name.

* Read before Iowa Veterinary Association, January 23, 1919.

In 1878 Congress appropriated ten thousand dollars, being its first, for the investigation of swine diseases. The 1885 Report of the Bureau of Animal Industry in reporting swine plague (hog cholera) says that "for about three feet from the valve (ileo cæcal) the entire mucosa of the ileum was necrosed, stained yellowish and could be scraped off." In the cæcum "the mucous membrane came aways in lots." In transmitting the report in 1889 of work done by Salmon and Smith, Salmon says: "It has been discovered in the course of these investigations that there are two very different and distinct epizootic diseases of swine in this country which are widely prevalent, and which had previously been spoken of under the one name of hog cholera or swine plague. These two names had, therefore, been used synonymously previous to 1886, when the differences between the diseases were pointed out in the reports of this Bureau. It was then deemed best to apply the term hog cholera to that disease in which the intestines were found most affected."

This same report in describing the lesions of hog cholera says: "In some cases the necrosis, instead of appearing in circumscribed ulcers from one-sixteenth to one-half inch or more across, involves the whole surface of the mucosa, giving it the appearance of a so-called diphtheritic membrane. In such cases the walls of the intestine are very much thickened and so friable as to be easily torn with the forceps in handling. Such necrosis is rare in spontaneous cases, but it quite invariably appears in animals which have been fed with pure cultures of hog cholera bacilli."

The distribution of the ulcers varies but slightly. They appear most frequently in the cæcum and on the ileo-cæcal valve, as well as in the upper half of the colon. The lower half is implicated in severe cases only, and then less extensively.

In this report, which was issued thirty years ago, we find accurately described every condition we are able to find today. When the discovery of hog cholera virus was announced in 1903 a basis for the scientific, systematic control of the disease was laid and our conception of hog cholera was revised. The development of hog cholera serum was the logical result. This illustrates the futility of attempting classification and suggesting specific prevention or treatment of infectious diseases unless and until the specific cause can be definitely established, as a knowledge of the cause of a disease affords not only a sound but the only basis of successful prevention and rational treatment.

The discovery of the virus also led to the conclusion and suggestion by some authorities that intestinal and pulmonary lesions were secondary and that they were of no significance if the virus could be controlled. Thus followed the period when hog cholera was regarded as the only disease of importance among swine. In the past few years, however, we have found that the so-called secondary conditions, although not uncommonly associated with hog cholera, may and frequently do exist independently, as they probably have for a half century or more. As a result of this development the disease characterized by lesions produced by *B. suis*, already referred to, was left without a name. Salmonellosis has been suggested, but very fortunately is not being adopted, as it has nothing to recommend it. Necrobacillosis is now quite generally used for the necrotic or diphtheritic enteritis. This name, in some cases, may be correct, but is absolutely wrong when the condition is caused by organisms other than *B. necrophorus*, as has been found by numerous investigators. In some European investigations there is quite constantly found an organism closely related to, if not the same as *B. suis*, and the disease, which so far as can be ascertained is similar to the diphtheritic condition of the intestine found here, is called pig typhus. Others have found other organisms, among which are *B. necrophorus*. Much work still remains to be done before we can state whether the disease has one specific or several causative agents. Until research laboratories are able to clarify the etiology, let us "keep our feet on the ground," as we are dealing with conditions that have existed before many of us were old enough to show an interest in diseases of any kind. In fact, reports issued from 1885-1889 contain some of the finest descriptions and color plates of conditions exactly as we find them today that can be found anywhere.

The first and most important fact practitioners should determine in all cases is whether hog cholera virus is actually present. We should be very certain that virus is not present before the owner is advised that his hogs are not suffering from hog cholera and serum will do no good. The tendency a few years ago was to call everything hog cholera. At present it is in the opposite direction, the favorite names being diphtheritic or necrotic enteritis (necrobacillosis) and "Flu." The mixed infection bacterin propaganda put on by commercial concerns has helped to bring on the present situation.

In view of the fact that the lesions produced by organisms other than hog cholera virus in outbreaks of hog cholera may exist as independent diseases in cases where the virus has not been present and further that the above facts are becoming generally recognized by the veterinary profession, we should consider that the situation, according to our knowledge today, suggests the following:

(a) Hog cholera caused by a filterable virus. When uncomplicated, lesions are almost exclusively of a hemorrhagic nature and frequently very few lesions are present. Its course is acute and there is no known cure. It is by far the most contagious and fatal disease we have among swine, but can be effectually prevented by properly prepared and carefully administered serum. One attack or proper serum-virus treatment confers durable immunity.

(b) Diphtheritic or necrotic enteritis (pseudo hog cholera, pig typhus, para typhus of hogs, bacillary hog cholera, necrobacillosis, salmonellosis, etc.), which in the light of our present knowledge may be caused by one or more of the following organisms:

1. *B. suis* pestifer. Salmon and Smith.
2. *B. enteritidis*. Gartner.
3. *B. coli*.
4. *B. typhi suis*. Glasser.
5. *B. voldagsen*. Damman and Stedefeder.
6. *B. necrophorus*.

The lesions are those particularly emphasized and regarded as most characteristic by Salmon and Smith in describing the disease named by them "Hog-Cholera." At present since the name hog cholera has been appropriated for the disease caused by the virus it is erroneously very commonly called necrobacillosis.

It is most frequently found in herds where some disease, condition of nutrition or other influence has caused a reduction in vitality and consequent decreased resistance of tissues. We are not certain, however, that this is always necessary. Experience in many cases seems to indicate that it is not. There may be localized inflammatory oedema in the early stages. Later, however, the changes most often seen are localized ulcers covered with diphtheritic membranes, usually in the caecum. In some cases the process may extend to a large section of the lower portion of the small intestine and the upper portion of the large.

The wall may become thickened and the intestine resemble in form a piece of garden hose.

(c) Swine plague. This disease, usually pulmonary in form, is caused by *B. suis*. As a primary disease it most frequently occurs sporadically and only occasionally may become enzootic. While practically all forms of pneumonia may be found in hogs, *i. e.*, catarrhal, croupous, necrotic, verminous, etc., most cases could probably safely be placed under swine plague which lost the highly contagious character formerly attributed to it when hog cholera virus was discovered to be present in the extensive outbreaks. I believe that the prevalence of a highly acute disease caused by this organism, which some prefer to call hemorrhagic septicemia, is very much exaggerated.

Several other organisms, such as streptococci, staphylococci, *Bacillus coli*, *Bacillus pyocyaneus* and, in a large percentage of cases, *Bacillus pyogenes suis* are found. Under favorable conditions any of the above may produce pneumonia which cannot be distinguished in most cases from the disease caused by *B. suis* or what is known as swine plague. We must remember, however, that the simple finding of an organism does not establish it as an etiological factor. Some, in fact, may be found in healthy hogs. This is especially true of the bipolar organisms. Whether we shall call this condition swine plague, hemorrhagic septicemia or still some other name, let us not change until we are certain that we have an improvement, that the name is applicable to the condition and carries a significance to the user thereof.

Both of the latter diseases and (c)—are most frequently found associated with hog cholera because the invasion of the body by a filterable virus predisposes it to secondary infection and in many cases the symptoms and lesions of the primary disease are obscured. There is, therefore, according to this conception, no intestinal or pectoral form of hog cholera, and probably few cases, if any, of chronic hog cholera. The inflammatory necrotic conditions in the pulmonary and digestive organs are distinct diseases and should be regarded as such whether complicating hog cholera or not.

TICK ERADICATION PLANS FOR 1919.*

J. R. MOHLER,
Chief of the Bureau of Animal Industry.

*Mr. Chairman, Fellow Employees of the Bureau
of Animal Industry and Friends:*

Since coming into this gathering of those so vitally interested in tick eradication, my mind has reverted to a somewhat similar but decidedly smaller meeting which was held at Richmond, Va., in the fall of 1905. The occasion was the annual convention of the Southern Commissioners of Agriculture, and the audience consisted of less than two score men. I was afforded the privilege of choosing for my topic whatever subject I considered the chief prerequisite in tick eradication and I selected the title "The Education of the Owner of Ticky Cattle." In those days men like one of the late Senators of South Carolina thought tick eradication was ridiculous and on one occasion while visiting Clemson College he said his grandfather's cattle had ticks, his father's cattle had ticks, and his own cattle had ticks, and if they were harmful he would have found it out ere this. However, long before this able man died he was an ardent tick eradicator and the State which so signally honored him was taken out of Federal quarantine, as you all know, on the first of last December.

It is a long, tortuous trail from those early days to the present and it has been one of constant effort on all our parts to educate, re-educate, and then educate once more.

The conference we are attending this week would fall far short of its purpose unless while meeting here we got renewed spirit from past achievements to surmount the obstacles that remain before American soil will be freed forever from the cattle fever tick. It would not be worth while unless every one of us carries away with him a clear idea of what we plan to do this year and a determination to do his full part.

There is no man in this meeting who cannot be proud, now and hereafter, of his share in the fight against the tick. You are doing a constructive work that has met with phenomenal success, especially in recent years, and in the first years as well, considering the prejudice and ignorance that had to be combated at that

*Address at conference of B. A. I. Employees, New Orleans, Feb. 11, 1919.

time. The work that has been done is its own argument, and the effort that remains is amply justified by the benefits from past accomplishments.

When the work is finally completed, when the tick has been permanently eradicated, you will have erected your own monument, and will enjoy the satisfaction of knowing that you have done something of real value for your country and the human race.

Few of us have had the privilege to wear the khaki in the world struggle that has just ended in complete victory for the Allies and the United States. It would be presumptuous to think that any American who did not risk his life for his country could have given service comparable to that of the boys who bled and died. But, at the same time, we were all working for our country, and we were all doing work that was essential to victory. It is not too much to believe that had the war stretched several years more, it would have been decided by the reserves of beef that the South possesses as the direct result of tick eradication. Even with our comparatively short participation, the meat that the South was able to produce, because of the absence of the tick, weighed powerfully in the food balance. So, while you wore no uniforms, dipped cattle without the inspiration of brass bands or bugle calls, and performed tasks that might have seemed humdrum when your hearts were "over there," you have done as your country instructed, and no man can do more.

But your work was not for the war alone, and the benefits of it will remain long after the gory horror of autocracy's downfall will be remembered only for the heroes it produced. You are making the South tick-free, and when you have done that the nation will be your debtor.

Tick eradication in the past two years has made a notable record. In 1917 the 70,754 square miles released from Federal quarantine far surpassed the record of any previous year. Again, in 1918, the release of 79,217 square miles eclipsed all previous accomplishments. These figures would command attention at any time. But they become truly remarkable when we remember that in 1917 and 1918 the United States was at war, and every energy of the American people was bent toward the one aim of whipping the Hun. Many of our Bureau men joined the colors, tens of thousands of men left the farms of the South for the army, it was difficult to ship supplies into this section because of the demands of the cantonments, everything was submerged beneath

the one dominating purpose. But, despite all that, tick eradication in 1917 broke all records, and in 1918 we found that 1917 was nearly 9,000 square miles too slow.

Much of the credit for these record-breaking accomplishments belongs to you, the representatives of the Federal Government in the fight against the tick. But we should be vain and foolish if we tried to appropriate all, or even most, of the credit. We must give full recognition, in the first place, to the coöperative work of the State governments and State agricultural colleges, and the county governments. We must acknowledge the aid of such organizations as the Southern Cattlemen's Association, the Texas Cattle Raisers' Association, the Florida Tick Eradication Committee, the Southern Settlement and Development organization, the Georgia Land Owners' Association, and the Southern Pine Association. We must recognize the consistent and clear-sighted support of the daily and weekly newspapers and the agricultural and live stock journals of the South, without whose aid we might still be battling with prejudice everywhere. And we must give due credit to the associations of the bankers and other business men who have led their communities to a realization of the benefits of tick eradication.

More than that, we must, everyone, take off our hats to the farmers, live stock raisers, and other people, in general, of the South. We must remember that while these people were helping tick eradication, they were not only buying Liberty Bonds, subscribing to the Red Cross and other organizations, and sending their sons to war, but were accomplishing notable things in raising the food crops that were regarded as essential to a strong America. When the slogan, "The South Must Feed Itself," was sounded the farmers of the South answered. Before the war the South imported annually about \$600,000,000 worth of corn, hay, grains, mixed feed, flour, meat and meat products, dairy products, poultry and poultry products, and canned goods. There has been a great change. In 1918 the fifteen Southern States, including all the tick-infested States, produced 141,787,000 bushels more corn than they harvested in 1909. The eleven States comprising the cotton belt produced 135 per cent more wheat in 1918 than in 1909. These same States during the same period increased their oat crop 133 per cent; their hay yield, 128 per cent; Irish potatoes, 117 per cent; and sweet potatoes, 67 per cent. The same tendency is shown in live stock production. As an instance, in 1914 Mississippi marketed only 86,229 fat cattle,

while in 1916 it shipped 156,237 animals to the St. Louis market, an increase of 181 per cent.

When we look back over what has been done, and consider that we are sure of the increasingly strong support of the Southern people who have done such great things, there is no reason whatever to fear that tick eradication will not win the most complete success, and that through tick eradication the South will become the live stock section that it should be by reason of its climate and other natural advantages.

The achievements of past years, however, now are history. We have met here to plan the 1919 campaign. My notion of what should be done this year, what must be done, and what will be done, is this:

Make 1919 the worst year for the tick.

It can be done. There are no can'ts in this fight. Tick eradication is well past the half-way mark, and it is at high tide. Unscrupulous politicians who formerly waved the dipping vat as a red flag are now finding that the dipping vat is a mighty good band wagon to climb on. Cattlemen who still oppose tick eradication are learning every day that their attitude is taking money out of their pockets. They, too, are seeing the light. I do not know of a leading man in any community who is against the campaign that has been proved beneficial by practical results in dollars and cents.

With the new State-wide compulsory dipping law in Texas, which becomes effective in the last zone of that State in 1922, it is not beyond reason to hope that the Federal quarantine can be entirely lifted from American territory at the end of 1923. We may regard "A Tick-Free South in 1923," as our aim. But to realize that aim, remember that the area still under quarantine is 270,036 square miles. The campaign must not be allowed to lag in any year and we should start off this year by setting up another record. Judging by what has been done in 1917 and 1918, I believe we can set the pace by cleaning up more than 90,000 square miles in 1919. That will "Make 1919 the Worst Year for the Tick."

The total number of cattle dipped in the South Texas counties during January, 1919, was 1,033 herds, comprising 43,213 cattle. A total of 17,983 cattle, or 286 herds, underwent systematic dipping, while the remainder, or 747 herds, including 25,230 cattle, received preliminary dipping.

CLINICAL AND CASE REPORTS.

ECONOMICAL TANK FOR AIR TREATMENT OF PARTURIENT PARESIS.

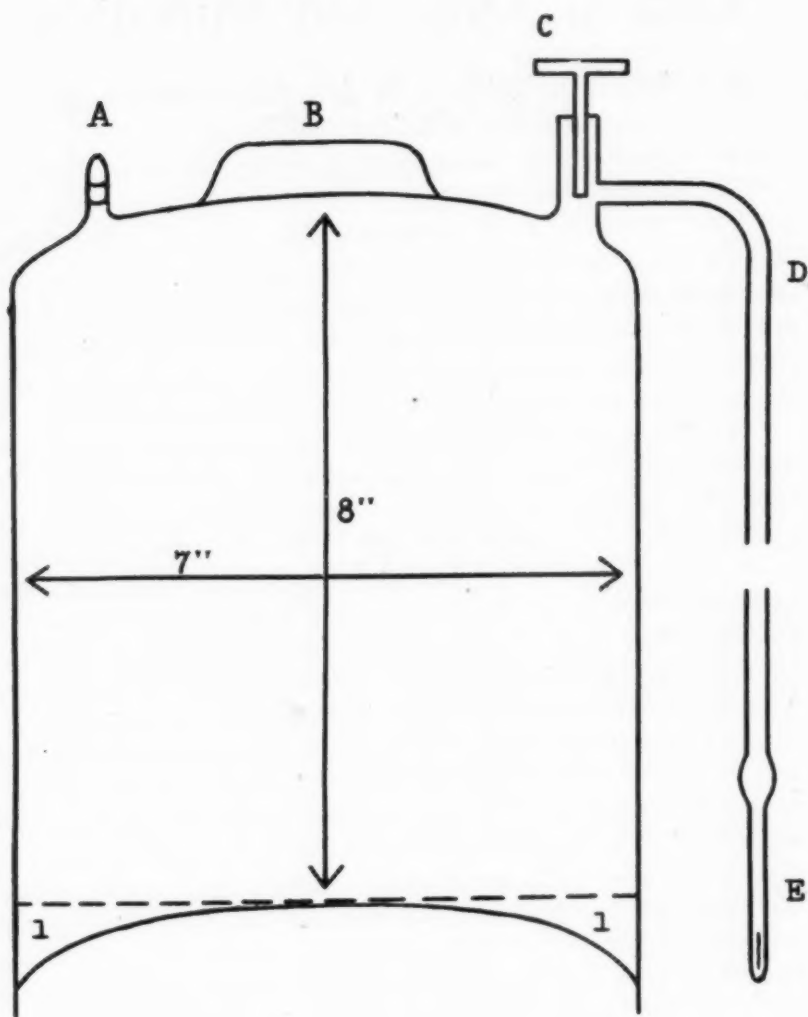
I. D. WILSON, College Station, Pa.

In treating parturient paresis with the ordinary air pump apparatus, the writer has experienced occasional cases of mastitis following the treatment, even when the air was filtered through sterile absorbent cotton. Oxygen tanks are expensive and considerable care and expense are involved in having them refilled.

This led to the contrivance of the tank herewith illustrated. This tank can be made by any tinsmith with but little expense. It is filled with the ordinary automobile tire pump and when pumped up to sixty pounds pressure (determined by tire gauge) holds enough air for two ordinary sized cows. Before filling with air, however, the plunger from the intake valve is removed and about six ounces of 70 per cent alcohol or some other suitable antiseptic is poured into the tank. After the tank has been filled with air to sixty pounds pressure (more or less depending upon the weight of the material used in the construction of the tank) if it is to be used at once, it should be thoroughly shaken, which causes the antiseptic in the tank to wash the air, thereby rendering it sterile. If the air in the tank is not to be used at once all that is necessary is to set it away, allowing sufficient time for the bacteria-laden dust particles to settle into the antiseptic in the bottom of the tank. The rubber tube leading from the tank to the teat tube and the teat tube should be sterilized by boiling before use, or when this is impossible by inverting the tank and opening the needle valve a small amount of antiseptic will be sprayed out through the rubber and teat tubes, rendering them sterile if the proper antiseptic is used in the tank.

The advantages of this apparatus may be summed up as follows:

1. Sterile air is provided.
2. Convenient and inexpensive to use.
3. Does not suggest to the laity to "rig up" the bicycle or automobile pump to treat their own cases.



- A. Automobile tire valve (inflow)
B. Handle.
C. Valve from gas fixture (outflow)
D. Rubber tubing three or four feet long.
E. Test tube.
1. Antiseptic level.

SOME EXPERIENCES OBTAINED FROM CONTACT WITH TUBERCULOSIS.

G. E. JORGENSEN,
Assistant State Veterinarian,
Clermont, Iowa.

It is the intention of the writer to present a general review of the pathology and bacteriology of tuberculosis, basing this review upon four years of experimental work with this organism. The purpose for which this discourse is intended is to recall the attention of the profession to one of the most destructive diseases that we have to deal with. This article will be presented in form of a series of case reports.

CASE NO. 1.

Was called to see a cow that was ill in the pasture. History showed that two other cows had been afflicted with a similar condition and died. This cow had been ailing for one week. Before being taken ill, the owner claimed, this cow was the fattest and nicest cow he had. Examination showed in the animal the last stages of what appeared clinically as a septic infection, together with an unusual emaciation. Prognosis unfavorable and slaughter advised in order to determine by an autopsy what the true cause was. This was done and revealed an acute general tuberculosis, involving every organ and tissue except the bone. Every lymph gland showed involvement, as did the mammary gland, in the right anterior and posterior quarters. Smears made from lesions in lungs, liver, mesentery and inguinal lymph glands and from post-mammary gland all showed the *B. tuberculosis* when stained by the usual acid-fast method. Transfers from the lesions in the lungs and mammary gland showed no growth on any of the usual media, except the egg method as prepared according to Dorset's method. Upon this material a few tiny colonies appeared in ten days. Pure cultures were obtained from mammary gland, but from the lung a mixed growth was obtained containing pus cocci, etc.

After several attempts a few colonies developed from milk from the two quarters showing no affection whatever. These proved to be *B. tuberculosis*. This proves that the mammary gland does not need to be infected in order to be dangerous. In other words, the *B. tuberculosis* seems to be able, by metastasis,

to be present in the milk in apparently healthy glands. By passing the organism here isolated through two different rabbits an organism was isolated that grew very readily on most culture media containing glycerin. When inoculated into fowl the lesions typical of tuberculosis developed locally, later causing death by a gradual emaciation. It was not possible to demonstrate the organism from lesions in the fowl. Later, when the remainder of the animals in this herd were subjected to the tuberculin test, three others reacted, of which one, on slaughter, was found to be so bad that she was tanked at the slaughter house.

CASE NO. 2.

Was called to treat two cows suffering from a form of diarrhœa that resembled somewhat an infection with the *Eimeria bovis*. These cattle were run down so that hardly anything remained but the bony skeleton. They were constantly passing fetid, blood-stained liquid and refused absolutely to eat. Microscopic examination of the feces for the presence of the coccidiosis parasite was negative, but an acid-fast stain showed a small red bacillus. Fearing that I was dealing with an infection with the *B. paratuberculosis*, I tried by animal inoculation and transfers to media to get a pure culture, but the extemporaneous organisms present outgrew the organism searched for, so that I did not succeed, the media being covered in a few days so that no accurate work could be done, and I had no "antiformin" to work with, hence gave it up and decided to apply a tuberculin test. The animals both died before this and on post-mortem showed an acute intestinal tuberculosis with involvement of the liver and associated glands. No lesions were found in the lungs of one, but in the other an encapsulated lesion was found in the right ventral lobe. Enlargement of the supramammary glands was seen in both, but only in one was there any lesion, and that was very small. Attempts at demonstrating the organism in smears from the milk or growing it in media were not successful. The tuberculin test showed no others affected. It will be applied again later.

CASE NO. 3.

Was called to see a cow that showed all the clinical symptoms of tuberculosis. I advised her destruction. Post-mortem showed a well-developed case of the disease affecting the lungs, intestines and uterus. Attempts to demonstrate the organism in the milk were unsuccessful and no lesions were seen in the mammary gland or associated lymph glands. A two-month-old fetus was removed

from the uterus and smears made from some of the liquid obtained from the abdominal cavity of this fetus showed *B. tuberculosis*. I will add, however, that there may have been a break in my technique, so that I may have infected my material from accidental contact with the infected uterus. I say this in order that no incorrect conclusions may be made. So I simply say that it is possible that the fetus was infected. Testing the remainder of the herd, I found no other cases. However, this fall while posting several hogs dead on this place from cholera I found tubercular infections in the submaxillary, pharyngeal and prepectoral glands of several animals, showing that there is still some of the animals that did not react then that are affected, as these hogs have no outside way of becoming infected.

CASE NO. 4

Was consulted with reference to a disease in chickens that was proving fatal to a number of them on this farm. I suspected a *B. avisepticus* infection and advised vaccination. Autopsy on two showed that I had guessed wrong and that I had a case of avian tuberculosis. These chickens had all been hatched out with an incubator and were in new, clean quarters, hence I concluded that it was not a case where an old tubercular infection was present. Microscopic examination showed a tubercular organism characteristic in morphology of the bovine organism. That following winter I tested the cattle on this place and we had three reactors. Apparently we here had an avian infection from a bovine origin. The more I study this organism the more I am inclined to believe that the different species are so closely allied that they may be regarded as one, and that the different characteristics—cultural and morphological—are simply due to the different environment of the different hosts.

Another thing that becomes apparent the more this disease is studied is the insidiousness of its character. It is like a prowling murderer at night—slower, perhaps, but as dangerous—and to man and beast alike. Its presence is discovered where least expected. If it were manifested by more violent and eruptive symptoms, as are some of our other infectious diseases, it would be less dangerous, for then public attention would demand its suppression. As it is, thousands of dollars are lost each year through its ravages, and many a human being is predestined to a life of suffering and an untimely death. Especially is this true among little children who are fed upon unpasteurized milk, as

they are in this community and many other localities. While a medical student in Chicago the writer was connected with the Cook County Hospital and there has seen many a little fellow hobbling along on crutches or trussed down in bed with a weight suspended from head and feet and on looking over the history sheet one invariably reads "T. B. Hip" or "T. B. Spine," etc., all from the poorer sections of the city where cheaper grades of milk are used, or were used at that time. It can not be disputed that the B. A. I. work and "Accredited Herd System" are doing a lot of good. However, what we need is Federal legislation that will make it compulsory to destroy or isolate tubercular animals. The writer has studied this disease from every angle since graduation, has preached the doctrine of eradication to the laity and from the experience obtained is of the opinion that, while many stock-raisers will take advantage of the system recently adopted, there are a good many who will not voluntarily do so, and as long as a certain percentage keep tubercular animals it will be impossible to eradicate it. Suppose that in 1914 foot-and-mouth disease was eradicated from those farms only where the owner was willing to have this done; then we would still have this disease with us. If the method adopted with foot-and-mouth disease is too drastic, then why not adopt the Bang or palliative method and destroy only clinical cases and isolate non-clinical cases from the herd and progeny and feed the calves on sterilized milk only? In this way results would finally be obtained. It is to be hoped and prayed for that some time in the near future we may be provided with a method that will arrest the further progress of this disease, which, as Moore says, "does not destroy life by acute toxemia, but by a chronic and long-continued systemic poisoning and by morbid changes brought about by the localization of the lesions in the organs necessary to life."

TETANUS IN A COW FOLLOWING RETENTION OF THE PLACENTA.

E. MORGAN, M. R. C. V. S., D. V. H.,
Puerto Cabello.

HISTORY.

A criolla cow which had calved a strong, healthy calf at the expected time. The owner was a carter (I mention his vocation because I consider it might have some connection with the cause of this particular case). He called to see me one day, saying that

his cow had calved about twelve days previously, that part of the cleansing was still retained, and that the animal was off feed since the day before, but previous to that she was eating well. He asked if I would give him a cleansing drink for the cow. Also he informed me that on various occasions he had removed parts of the cleansing. I gave him a drench whose basis was mag. sulph., as I understood that the cow required an aperient.

The following day I met the owner, who informed me that the cow was somewhat worse, and that he found it impossible to administer the medicine, as they could not open the animal's mouth, in spite of several attempts, and that she was unable to drink, although appearing at times to be anxious to do so. On hearing this, I questioned him more minutely, as it seemed strange that retention of the placenta caused such hindrance to the animal.

I arranged to see the cow the following day. Next morning early, while standing in front of my office, I could see a cow in the distance coming towards me, being led by two dames. The movements resembled those of a bovine animal affected with "Sturdy," or "Gid," yet there was some particular difference, inasmuch as the tail now and again was held up, and sideways, also the limbs were not bent at the joints, but moved in a stiff manner. There was slight tympany, and on approaching the cow, her convulsions or spasms came on. The body was moist with perspiration, although imperceptible to the eye. The muscles of the jaws and neck were quite tense; the jaws completely fixed; the muscles of the limbs were quite rigid. The head was raised upward, and immediately the eyeballs retracted, with protrusion of the "haw," or *membrana nictitans*. The muscles of the extremities were more rigid than those of the abdominal wall.

DIAGNOSIS.

Owner was informed that the cow had tetanus, and that she should have been kept quiet instead of parading her through the town; also that the outlook was not very bright. The owner then quoted many cases of mules which were cured by rubbing the region of the jaws with turpentine and the body with fish-oil, and asked, "Would I have any objections to let him try this treatment until next day?" Knowing the Venezuelan character fairly well, and whether I said "Yes" or "No" he would all the same carry out his own treatment; also, seeing that he considered tetanus a mild and curable disease, I answered decidedly, "Yes; try."

Next morning the owner came with a smile on his face, stating that the cow had managed, with great difficulty, to sip two large bucketfuls of water just before he left. He returned in the afternoon, however, with the information that the cow had dropped dead after drinking the water, and that prior to dropping down she had swollen "like a toad does at the approach of a steam-roller."

He had also made, as he thought, a very careful autopsy, but all he found abnormal was in the uterus and vagina, where there was a quantity of sanguino-purulent fetid matter; also that the udder contained a great quantity of milk.

REMARKS.

The owner during this period was hauling surface earth from a field nearby to make a garden. Every day he had been attempting to remove the cleansing and only used a little grease on his hands, without any antiseptics whatever. Needless to say, he never attempted to wash his hands prior to manipulating the placenta inside the vagina. I have no doubt in my mind that in the first place tetanus in this cow was due to retention of the placenta, but whether the germs gained entrance by means of the carter's hands, which is most probable, or were inoculated from others sources, cannot be definitely stated.

Tetanus is most prevalent amongst horses and mules in Venezuela, but this is the first case I have yet witnessed among cattle.

Again, if we take the animals in general, this channel of infection is not considered a very common one for the tetanus germs to enter.

The drinking of a large quantity of water caused tympanitis, and some of the fluid might have entered the trachea as well. However, there seems little doubt that the water hurried matters to an abrupt ending.

Tetanus in ruminants is more serious even than in other animals, on account of the mechanism of rumination being thrown out of gear, with bad results.

In treating the disease in the bovine, it would be wise to make use of the trocar and canula to relieve the rumen of the accumulated gas, and therefore relieve pressure on several of the most vital internal organs, besides making use of the canula to introduce medicine directly into the rumen.

ABSTRACTS.

NOTE ON THE COMPARATIVE PATHOLOGY OF INFLUENZA.

GEORGE R. MURRAY, M. D., D. C. L., F. R. C. P.,
Temporary Colonel, A. M. S.; Professor of Systematic Medicine in
the Victoria University of Manchester; Consulting Physician
to the Italian Expeditionary Force.

The comparative pathology of an infective disease is always interesting, and it has in many cases thrown light on the modes of infection in man. During the present pandemic of influenza I have not met with any reference to the occurrence of a similar malady in either domestic or wild animals. It is possible that some animals have been affected, and it would be of interest to ascertain if any localized epidemics of influenza in animals have been observed. The pulmonary complications, as seen this year in man, alike in England, France, and Italy, due to mixed infections of the respiratory organs, so closely resemble those observed in an epidemic in horses which came under my notice more than twenty years ago that a brief account of it may be of interest at the present time. I write entirely from memory, but the main features of the epidemic were as follows:

A certain railway company had a number of valuable horses which were kept in large stables. Two long rows of stalls were arranged in each of the buildings, which were well ventilated and kept in excellent condition. Many of these horses were rapidly attacked by an acute illness with symptoms of nasal catarrh which was accompanied by a clear, watery discharge from the nostrils. The majority of the horses made a good recovery, but some of them developed symptoms of acute pulmonary disease and died. Post-mortem examination by the veterinary surgeons in attendance showed that death was due to acute lobular pneumonia, complicated by pulmonary abscesses which developed in the areas of consolidated lung. A puzzling feature of the epidemic was the irregular distribution of the cases. The malady did not spread in sequence from stall to stall, but cases occurred at irregular distances from each other in the same stable.

As several valuable horses had died and the disease continued to spread, I was asked to investigate the cause of the epidemic and to give advice as to the most suitable means to be adopted

in order to stop the further spread of the infection. On making a bacteriological examination I obtained from the nostrils of horses suffering from the acute nasal catarrh cultures of a small bacillus closely resembling, if not identical with, Pfeiffer's bacillus. The same bacillus was recovered from the patches of broncho-pneumonia, in the lungs of a fatal case. In this case there were several abscesses which had formed in the consolidated areas of the lung. Cultures prepared from the pus in these abscesses yielded growths of staphylococcus albus.

It therefore was evident that the disease was primarily an acute catarrhal infection of the respiratory passages closely resembling influenza in man. In some cases the same bacillus invaded the lung, and broncho-pneumonia supervened. This was complicated by a secondary staphylococcic infection which caused a rapid breaking down of the consolidated lung and the formation of localized abscesses.

In human influenza the usual mode of spread appears to be by aerial convection of the infection to those in the immediate neighborhood of the patient, as was so clearly shown by Major Michael Foster and Major Anstey Cookson in the case of a limited outbreak in a surgical ward. In the epidemic in horses the irregular spread of the disease was apparently due to the use of dry moss litter as bedding, fine particles of which could be seen floating in the air when illuminated by a ray of sunlight. The nasal discharge of an infected horse dripped on to this bedding, where it dried and was carried to all parts of the stable by light currents of air.

The company was advised to remove all the moss litter, and after thorough cleansing to wash out each stable with a disinfectant and to use sanitas sawdust as bedding. This was done in each stable while the horses were out at work, with the result that the epidemic ceased at once and no more horses were lost.

The chief points of interest in this epidemic were the resemblance of the disease to human influenza, the rapidly fatal results of the acute pulmonary complications caused by a double infection of the lung, and the part played by dust in increasing the range of aerial convection from one animal to another. The range of aerial convection in human influenza is usually short, but in the management of patients it is advisable to keep the air of the sick room as clean and as free from dust as possible, and to disinfect all handkerchiefs and spittoons just as in cases of open pulmonary tuberculosis.—*The Lancet*, London.

NOTES REGARDING TICKS FOUND ON FARM ANIMALS IN NEW ZEALAND.

C. J. REAKES,

In Journal of Agriculture, Wellington, New Zealand, 1918,
Feb. 20, Vol. 16, No. 2, pp. 83-86.

The ticks which transmit bovine piroplasmosis in Queensland and North America (*Margaropus* (*Boophilus*) *annulatus australis* and *M. annulatus*, respectively), have never been discovered in New Zealand.

The ticks that occur on cattle are *Ixodes ricinus* (commonly called the "dog tick" or "castor bean tick") and a species of *Hæmaphysalis*. Although piroplasmosis or any other serious trouble caused by ticks does not exist among cattle in New Zealand, yet the experience of other countries goes to show that ticks may be the source of trouble to stockowners in the future, inasmuch as they occasion loss of condition, decrease in the milk yield, deterioration in the value of hides, and mortality among animals already weakened by various forms of sickness, insufficient food, or other causes. Measures are thus advised for their eradication. It is recommended that the infested parts of the skin be sprayed with tar, after which all dead ticks should be collected and burned.

Other spraying preparations tried and found to be somewhat less effective consisted of kerosene $\frac{1}{2}$ pint, linseed oil $\frac{1}{2}$ pint, and sulphur 1 ounce; or kerosene 10 ounces, lard 10 ounces, tar 2 ounces, sulphur 1 ounce. Very strong solutions of sheep dips also proved effective, but cattle were liable to suffer from their effects when used at the necessary strength. Dipping is the only effective method available in the case of cattle unaccustomed to handling. As long as tick fever is kept out of New Zealand there will be nothing to fear from the ticks on that score; but if they become too numerous they may cause trouble in ways previously suggested.—*Tropical Veterinary Bulletin*.

PRESENCE OF RABIES VIRUS IN THE SPLEEN.

P. REMLINGER,

Ann. Inst. Pasteur, 1918, Aug., Vol. 32, No. 8, pp. 406-412.

Babes appears to be the only investigator who succeeded in transmitting rabies by the inoculation of material from the spleen; the spleen of one rabbit out of six experimented on in

this way proved virulent. Nevertheless, the presence of inflammatory and sometimes even necrotic nodules in the spleen in certain cases of rabies in man and other animals led this author to believe that the organ harbored in some cases the virus, which might thus set up lesions analagous to those found in the nervous centers. With this exception, all the observations described in medical literature disclose negative results.

Remlinger carried out a series of experiments with the spleens of guinea pigs that had succumbed to rabies, in a manner similar to that described in his previous contributions to the study of rabies. From these experiments he considers himself justified in concluding that the rabies virus may be encountered much more frequently in the spleen than has been hitherto recognized. Its presence was revealed eight times in the course of forty-two experiments and was proved to be quite independent of post-mortem generalization, inasmuch as twelve guinea pigs slaughtered just before death would have naturally taken place furnished three positive results. This result must be attributed apparently to the fact that the virus may be found much more frequently in the blood than writers have admitted. Marie (A.) has already drawn attention to this point, which the author proposes to investigate afresh. Instead of tending to favor the diffusion of the virus in the spleen, the onset of putrefaction seems in the first place to render it less frequently discoverable (spleens of animals sacrificed before natural death—3 positive in 12 experiments; spleens of animals post-mortemed within 12 hours after death—3 positive results in 12 experiments; spleens of animals post-mortemed at longer intervals than 24 hours after death—2 positive results in 18 experiments).

A comparison of these results is, however, somewhat illusory on account of the fact that it is impossible to resort to sub-dural inoculation after the onset of putrefaction, and the infection following on intramuscular inoculation is of an appreciably lesser degree of severity.—*Ibid.*

POLYVALENT SERUM OF LECLAINCHE AND VALLEE IN THE TREATMENT OF CANINE DISTEMPER.

Bresson gives an account of this in the *Revue générale de Médecine Vétérinaire* for 1917. His view of distemper is as follows. In veterinary pathology, distemper is perhaps the type of infections in which the secondary action of common microbial

agents exceeds in gravity the primary action of the specific agents. The filtering virus of Carré, the causal agent of distemper, appears, when alone, to be easily tolerated by the animal. The clinical signs, the serious symptoms, and the mortal lesions observed in this disease are caused by the ordinary microbes of suppuration (*Streptococci*, *staphylococci*, etc.), which discharge their pathogenic rôle secondarily, by favor of the effects of the filtering virus. For this reason, leaving on one side all symptomatic treatment, the management of distemper is reduced to combating and preventing the secondary action of pyogenic microbes.

Starting upon this basis, and proceeding solely upon the principle of the great importance which secondary pyogenic infection possesses in distemper, the author, upon the advice of Leclainche and Vallée, has used the polyvalent serum prepared by these workers. All his distemper cases were treated systematically for five days with a daily subcutaneous injection of from 40 c.c. to 50 c.c. of polyvalent serum. Two dogs were treated with intravenous injections of 30 c.c. without any particular result. At the end of five days the dose was reduced to 15 c.c. every two days. The injections were made at different sites (neck, shoulder, flank), and without special antiseptic precautions.

In addition to the serum the author employed the following symptomatic treatment. Upon the entry of the dogs into the infirmary he gave an emetic of syrup of ipecac, and followed this up with tonic injections of caffeine, a milky diet, rice water, powdered carbon, and alcohol.

From his experiences the author concludes that the polyvalent serum, used in massive doses from the time of the appearance of the first symptoms, has preserved the animals from pyogenic complications, and that, used upon animals bearing manifest secondary lesions, it combated the infection by the pyogenic agents causing these lesions, and enabled a large number of such animals to be saved.—W. R. C., in *Veterinary Journal*.

ARMY VETERINARY SERVICE.

First Lieutenant W. K. Herbott of the 77th Field Artillery, American Expeditionary Force, in sending in his dues to the Secretary, writes as follows: "Please excuse my delay in sending in my dues. When I received the notice I was up in the Sepsarges woods, northwest of Verdun, and it was almost impossible to secure a money order. Shell fire was intense at all times and one didn't go on many unofficial errands. While I have missed several of the Journals, the October and November numbers reached me all right and I certainly enjoy them thoroughly."

Dr. Warren E. Heath of Columbus, Montana, a member of the A. V. M. A., is a captain in Battery D, 340th Field Artillery, American Expeditionary Forces in France.

"ROYAL" ARMY VETERINARY CORPS.

His Majesty's approval of the prefix "Royal" to the title of the Army Veterinary Corps marks a distinct advance in the status of the military side of the veterinary profession; and, inasmuch as by far the greater bulk of the A. V. C. is at present composed of civilian practitioners with temporary commissions, it is an acknowledgment of the present position of British veterinary science in general. All professions have been afforded an opportunity by the war to prove their worth, and the veterinary profession has responded manfully. Quite recently Major General Sir Frederick Smith made public some of the work which has been done by the British A. V. C., and it is gratifying to learn from other sources that the French and American Veterinary Corps have acquired much from British methods. The organization of the corps has been perfected under war conditions, and hospitals have been erected and equipped at the various fronts in a manner that has called forth unstinted praise. It is announced that in regard to the animals treated at the convalescent depots on the Western front, recent figures show that 72 per cent have been evacuated to the Remount Department for re-issue to the front. The percentage of discharged animals has been higher than this, but after four years of war the age of the animals has had its effect on the number of patients judged fit for further active service. As in all previous campaigns, contagious diseases have accounted for a large proportion of admissions to hospital; these, however, have been so successfully dealt with that contagious diseases of all kinds were responsible for less loss at the time of signing of the armistice than at any other period of the war.—*The Lancet*, London.

ASSOCIATION NEWS.

AMERICAN VETERINARY MEDICAL ASSOCIATION.

President Moore has appointed Major Charles E. Cotton a member of the Committee on Resolutions to succeed the late Dr. S. H. Ward.

SECRETARY'S OFFICE.

The Secretary's office is naturally the one that handles the usual business of the A. V. M. A. and the Secretary is always glad to assist members of the Association in every way possible.

Recently a member wrote that he had taken a state board examination several months ago and was unable to learn the results, nor had he received a reply to his letter of inquiry. This matter was taken up and a prompt reply obtained.

The Secretary wishes he was in a position to give every member "a mule and forty acres," but, unfortunately, our financial circumstances do not permit. Some requests we do not feel are within our province, particularly those having to do with individual transfers or promotions in the government service.

Recently a request that the A. V. M. A. inaugurate legislation that would permit veterinarians who had been in the army service to secure a license to practice in any state without passing the state examination upon the payment of the regular fee. This matter was referred to the Committee on Legislation. Chairman W. Horace Hoskins replied as follows:

"The committee are unanimous in their decision that such legislation is not feasible, and so in conflict with state rights that it would be unwise to advocate the same."

OTHER ASSOCIATIONS.

UTAH VETERINARY MEDICAL ASSOCIATION.

At a meeting of the Utah Veterinary Medical Association, held some time ago, the following officers were elected:

President—Dr. W. A. Stephenson.

Vice President—Dr. Bundy.

Secretary-Treasurer—Dr. Hugh Hurst.

H. J. FREDERICK.

MISSISSIPPI VALLEY VETERINARY MEDICAL ASSOCIATION.

The mid-winter meeting of the Mississippi Valley Veterinary Medical Association was held at Galesburg, Illinois, January 24, 1919.

Practicing veterinarians from within a wide radius of Galesburg made up a large and representative attendance. Dr. D. M. Campbell of the Legislative Committee of the Illinois Veterinary Medical Association substituted for State Veterinarian Peters and ably and lucidly explained veterinary practice legislation now pending before the Illinois Legislature.

The following interesting programme was presented:

"Better Coöperation Among Veterinarians," Dr. G. B. Munger, Bureau of Animal Industry veterinary inspector, Rock Island District.

"Swine Plague in Swine," Dr. H. R. Schwarze, State Bacteriologist, Springfield.

"Influenza in Horses," Dr. W. G. Neilson, Monmouth.

"Hemorrhagic Septicemia in Bovines," Dr. James McDonald, Bureau of Animal Industry inspector in charge of Illinois.

"Various Methods in Tuberculin Testing," Dr. F. E. Brown, Blandinsville.

"A Short Experience in Army Life," Dr. W. Lester Hollister, Avon.

G. B. MUNGER.

MICHIGAN STATE VETERINARY MEDICAL ASSOCIATION.

The annual meeting of the Michigan State Veterinary Medical Association was held in the council chamber of the city hall at Lansing, Michigan, beginning February 4. The first day was devoted largely to the president's address, reports of committees and a discussion of "Diseases of Swine Other Than Cholera" by Dr. J. B. Killum of the Bureau of Animal Industry. Tuesday evening the banquet was held at the Hotel Wentworth. In the absence of Dr. G. W. Dunphy, Dr. N. S. Mayo presided as toastmaster. Among the speakers were Governor Sleeper, Hon. Thos. Read, Speaker of the House of Representatives; Lieutenant Colonel John H. Wilson, of the Canadian Army Veterinary Corps; Lieutenant Runnells, of the Veterinary Division of the Michigan Agricultural College; Mr. H. H. Holliday, President of the Mich-

igan Live Stock Sanitary Commission, and Dr. Newton of Toledo. An unusually interesting and entertaining evening was spent.

On February 5 Colonel Wilson, of London, Ontario, gave an unusually valuable paper on "The Duties of the Veterinarian in the Great Wars, 1914 to 1918." In this paper Colonel Wilson clearly brought out the great importance of the "paper work" in connection with the handling of large numbers of animals in the army, and also showed the excellent work that had been done by the British Veterinary Service, not only in France, but in all other parts of the world where military operations were undertaken. Dr. N. S. Mayo discussed the subject of "Veterinary Advertising." A round table discussion of practical problems that had been met with in practice proved particularly interesting.

Dr. F. W. Chamberlin, of the Veterinary Division of the Agricultural College, was elected president to succeed Dr. A. B. Curtis, who has so ably looked after the affairs of the association during the past year.

PENNSYLVANIA STATE VETERINARY MEDICAL ASSOCIATION.

The thirty-sixth annual meeting of the Pennsylvania State Veterinary Medical Association was held at the Penn-Harris Hotel at Harrisburg on January 22 and 23.

The meeting was well attended, due in part, no doubt, to the inauguration of the Governor, which was held the day previous to the meeting, and to the fact that ten other associations for the betterment of agriculture held their annual meetings at the same time.

The following program was rendered:

"Purpura Hemorrhagica," B. F. Senseman.

"The Practitioner in the Control of Infectious Diseases," V. A. Moore.

"Live Stock Industry in South America," illustrated, J. H. McNeil.

"Problems Confronting the Live Stock Producer in Pennsylvania," Mr. M. T. Phillips.

"The Progress of Tuberculosis Eradication," J. A. Kiernan.

"Tuberculosis Eradication in Pennsylvania," T. E. Munce.

Discussion by E. S. Deubler, P. E. Quinn, H. W. Turner and H. C. Reynolds.

"Methods for Advancing Pork Production in Pennsylvania,"
H. H. Havner.

Ten minute discussions:

"Field Demonstrations," Mr. P. E. Dougherty.

"Pure Bred Hog Breeders Associations," Mr. J. M. Fry.

"Juvenile Pork Producers," Mr. N. E. Garber.

"Health and Care," E. C. Deubler.

"Hemorrhagic Septicemia, Hog Cholera of Swine," Edw. A. Cahill.

"Hog Cholera Immunization," E. L. Stubbs.

"Practical Surgery: As It Is and As It Should Be," John W. Adams.

"Infectious Abortion and Sterility in Cattle," W. H. Ridge.

"Observations and Results Obtained in Treating Cattle for Sterility," Benjamin Price.

"A Report on the Control of Abortion Disease," G. A. Dick.

Discussion opened by E. S. Deubler, F. A. Marshall, M. E. Patrick and H. W. Barnard.

The following resolutions were unanimously adopted:

Whereas, the live stock industry of this country has assumed unprecedented importance, in that the food products issuing from this source are not keeping pace with the rate of increase of the population of the country, and

Whereas, the encouragement for a greater production of live stock can be fostered by the nation in an effective way by the control and eradication of the diseases that not only cause great loss but also discourage many from engaging in stock raising, and

Whereas, the services of the veterinarians of the Bureau of Animal Industry have materially aided and assisted in the development of the industry to its present state, and their services are indispensable to its future welfare, and

Whereas, the cost of living has continually grown higher and higher, and the salaries of many classes have been advanced to meet it, the salaries of the veterinarians of the Bureau of Animal Industry have increased scarcely at all, and

Whereas, the salaries they receive are not commensurate with the high standard of education and efficiency required in their work, therefore be it

Resolved, that the Pennsylvania Veterinary Medical Association go on record as stating that they appreciate the assistance rendered them in Pennsylvania by the Bureau of Animal Industry veterinarians and that they believe the men merit the increase

in salary and classification of services as set forth in the Rainey Bill, and be it further

Resolved, that the secretary of this association be instructed to send a copy of these resolutions to the United States Secretary of Agriculture and to each member of the National Congress from Pennsylvania and urge their support of the Rainey Bill.

For the succeeding year Dr. M. W. Drake was elected president, Drs. F. J. McNeal, B. M. Freed and E. S. Deubler were elected vice presidents, Dr. Thomas Kelly was elected treasurer, Dr. D. E. Hickman was elected corresponding secretary, Dr. I. D. Wilson was elected recording secretary and Drs. H. C. Reynolds, R. C. Gross, E. W. Powell, F. U. Fernsler and M. E. Patrick were elected trustees.

I. D. WILSON,
Recording Secretary.

IOWA VETERINARY ASSOCIATION.

The thirty-first annual meeting of the Iowa Veterinary Association was held at the Veterinary School of Iowa State College at Ames on January 22, 23 and 24, 1919. The interest of the Iowa veterinarians in the meeting may best be shown by the attendance, about 250 veterinarians being present, the largest attendance in the history of the association. Forty applications for membership were favorably acted upon by the association at the business session. The papers presented were timely and interesting, and the discussions lively. One of the features of the meeting was a one-half day session devoted to swine diseases, of which Dr. W. B. Niles of the Bureau of Animal Industry acted as chairman. The following papers were presented at this session:

"The Swine Disease Situation," C. H. Stange, Ames.

"Secondary Invaders and Their Relation to the Filterable Virus," G. A. Johnson, Sioux City.

"Observation of the Dissemination of Hog Cholera by Insects" (M. Dorset, C. N. McBride, W. B. Niles, J. H. Rietz), J. H. Rietz, Ames.

Reports on the Use of Mixed Infection Bacterins in Swine Diseases," G. A. Scott, Waterloo.

"Obstetrical Practice in Swine," C. G. Moore, Toledo.

A paper by Dr. J. H. McLeod, former mayor of Charles City, Iowa, on the necessity for municipal meat inspection service was well received and showed the opportunity open in this field of service for the veterinarian. Considerable discussion was carried

on regarding the proper use of the various biological products following a paper entitled "Immunization Products and Indications for Their Use," by Dr. Chas. Murray of Ames.

Very interesting papers were presented by Dr. F. M. Maxfield, Tama, Iowa, on "The Army's Fly Campaign" and by Dr. W. P. Bossenberger, Williams, Iowa, on "Malignant Edema."

The reports of the various standing committees on diseases and treatment, sanitation, therapeutics, surgery, legislation, and necrology were very interesting and showed the results of time and thought on the part of the committee chairmen and members.

The forenoon of the third day was devoted largely to demonstrations of breed types and judging of beef and dairy cattle, swine, and draft horses put on by experts from the Animal Husbandry Department of the college.

An excellent clinical program was carried out in the afternoon of the third day, consisting of a number of major and minor operations performed by veterinarians from different parts of the state, as follows: radical poll-evil and fistula operations showing proper and improper drainage, Bemis' nerve-blocking method and tooth extraction, roaring operation in standing position, castration of stallion in standing position, operation for prolapse of rectum, removal of actinomycotic tumor.

Dr. H. S. Murphey demonstrated a new method for operating on scrotal hernia in boar pigs to save the testicle.

A number of cases were presented for diagnosis and for examination during the clinic, among which was a case of paraphimosis in a stallion and a case of salivary fistula into the gut-teral pouch; also some cases showing various conditions of pus gravitation due to improper drainage. Anatomical demonstrations of the parts involved by the use of dissected specimens preceded certain of the major operations.

Considerable time was spent during the business sessions of the association in discussing needed legislation relative to live stock sanitary matters, etc., in which the veterinarian is directly interested.

In the way of entertainment and social diversion, on the first night of the meeting an athletic carnival of wrestling and boxing contests was staged by the college athletic department under the direction of Coach C. W. Mayser, and on the second night a smoker was enjoyed by the members, at which President R. A. Pearson of Iowa State College gave an illustrated talk on European agricultural conditions, and J. W. Coverdale, supervisor of

county agents in Iowa, discussed the relation between the veterinarian and the county agent.

The spirit of good fellowship and coöperation shown by the veterinarians at this meeting, and the interest shown in the papers and discussions, and in each other's problems, augurs well for the future of the veterinary profession. The secretary-treasurer's report showed the association to be in excellent condition financially.

The following officers were elected:

President—Dr. George A. Scott, Waterloo.

First Vice President—Dr. G. G. Miller, Council Bluffs.

Second Vice President—Dr. L. L. Lindsey, Graettinger.

Secretary-Treasurer—Dr. H. D. Bergman, Ames.

Member of Executive Board—Dr. G. A. Johnson, Sioux City.

H. D. BERGMAN, Secretary.

INDIANA STATE VETERINARY MEDICAL ASSOCIATION.

A larger attendance than heretofore was present at the Indiana State Veterinary Medical Association meeting which was held January 8, 9 and 10. About two hundred members and visitors were present.

The business part of the program was taken up during the afternoon of the first day, including reports of the Legislative Committee and Executive Board. This was followed by the election of officers and a few very interesting papers on topics of universal interest.

New officers were elected as follows:

President—Dr. Payson Schwin.

Vice President—Dr. J. Lee Klotz.

Secretary—Dr. G. H. Roberts.

Treasurer—Dr. J. W. Klotz.

The second day was entirely taken up by the literary program. Dean Skinner of the Agricultural Department, Purdue University, kindly consented to give a talk on "What the Veterinarian Should Do During the Reconstruction Period." His advice was most interesting and timely.

Dr. R. C. Julien, the only veterinarian in the United States who gave his time to Y. M. C. A. work in France, and who has just recently returned, gave a splendid talk on "How the American Soldier Helped to Win the War."

The subject "Contagious Abortion in Cows" was taken up by Dr. Ward Giltner and "Sterility in Cows" was taken up by Dr. H. E. Hallman, both of the Michigan State Experiment Station. I assure you these gentlemen handled the subjects in the most up-to-date, scientific and intelligent manner.

Besides the papers mentioned above, the following were presented:

"The Veterinarian of Today and a Decade Ago," Dr. W. J. Armour.

"My Experience in the Treatment of Blackleg in Cattle," Dr. F. E. Kling.

"Coöperation," Dr. L. E. Northrup, State Veterinarian.

"Association," Dr. W. B. Craig.

"Alum," Dr. J. H. Mills.

"Laminitis," Dr. G. M. Funkhouser.

"Proprietary Medicine," Dr. Payson Schwin.

"The Most Common Diseases of Cattle, Symptoms and Treatment," Dr. J. C. Rodger.

"Clinical Notes," Dr. O. A. Nelson.

"Sanitation," Dr. H. E. Whiffing.

"Our Relations in Animal Control Work," Dr. C. H. Hays, Bureau of Animal Industry.

"Lack of Coöperation Among Veterinarians," Dr. A. B. Carter.

"Treatment for Common Colics of the Horse," Dr. O. L. Boor.

"Stomach Worms in Sheep," Dr. George L. Clark.

"Unlocated Lameness Posterior Member," Dr. C. I. Fleming.

The usual number of clinics were presented and more interest was taken in the surgical operations than ever exemplified for a number of years.

G. H. ROBERTS, Secretary.

COLORADO VETERINARY MEDICAL ASSOCIATION.

The sixteenth annual meeting of the Colorado Veterinary Medical Association was held at Denver on January 21. The report of the Secretary stated that there were sixty-eight members in the Association, fourteen of whom had recently been in the service of the United States Army. Death had taken four members, i. e., Drs. A. G. Broecker of Denver, T. N. Slayton of Greeley, H. R. Millard of Cheyenne and E. W. Alkire of Fort Collins. Three of these died of pneumonia following influenza.

The committee on the examining board reported that Dr.

R. H. Bird of Greeley had been selected by Governor Gunter to fill the place left vacant by the death of Dr. A. G. Brocker.

The Legislative Committee reported that five bills of interest to the Association had been introduced in the Legislature. One of these provided for the appointment of county veterinarians where the county commissioners so desired. Another provided for licensing of firms selling hog cholera serum and virus and limiting its use to licensed graduate veterinarians. A third proposed to amend the stallion law by increasing the number of diseases for which horses might be rejected and licensing as grades only such as had one parent registered. A fourth provided for coöperation with the United States Department of Agriculture in control of tuberculosis, and the fifth required the collection of a tax on all horses, cattle and hogs within the State in order to create an emergency fund for use in case of an outbreak of disease. The Association endorsed the three bills providing for county veterinarians, the use of hog cholera virus and tuberculosis control.

The committee on uniform price for the administration of biological preparations made a general report as a result of a questionnaire sent to all members. No definite action was taken.

The new officers were elected as follows:

President—H. E. Kingman.

First Vice President—A. N. Carroll.

Second Vice President—J. F. Meinzer.

Secretary-Treasurer—I. E. Newsom.

Executive Board—A. B. McCapes, T. H. Brady, H. H. Tobin.

New members were elected as follows: John W. Welty, Torrington (Wyoming); Eugene Hover, Lamar; Wm. B. McGuire, Boulder; L. S. McCandless, Craig; Edwin W. McCrone, Littleton; Geo. H. Carr, Brighton; Edgar N. Stout, Monte Vista; Gordon N. Cline, Haxtum; M. E. Spratlin, Littleton; O. S. DeLashmutt, Steamboat Springs; T. E. Traylor, Denver.

Dr. G. W. Stiles, in charge of the Bureau of Animal Industry, Bacteriological Laboratory at Denver, gave a paper outlining the scope of the work and discussing the result of the first year of labor.

The future of racing in Colorado and its influence on the horse industry was discussed by Dr. M. J. Dunleavy, a member of the racing commission. He explained that all race meets in the State are now under the management of the commission and that betting is allowed only under *pari mutuel system*, the proceeds of which go to make up purses for the races.

Hemorrhagic septicemia was covered by a paper read by Dr. A. N. Carroll. This brought out considerable discussion on the disease as seen in the various animals within the State.

Dr. H. E. Kingman reported on the use of copper sulphate in necrotic enteritis in pigs. He intimated that the dose of 2 drams, which was commonly recommended, was too large and that by cutting the dose to one-half to 10 grains for very small pigs good results had been accomplished.

The ever-difficult problem of differential diagnosis of hog cholera was well handled by Dr. John D. Throver, who exhibited pathological specimens to illustrate his remarks. The discussion was opened by Dr. C. F. Harrington and indulged in by many of the members, and indicated that we were yet far from the solution of this perplexing question. I. E. NEWSOM, Secretary.

KANSAS VETERINARY MEDICAL ASSOCIATION.

In spite of the cold weather and irregularity of train service, the fifteenth annual meeting of the Kansas Veterinary Medical Association, held at Lawrence, Kansas, on January 2 and 3, proved to be one of the very best that the Association has ever held.

The President, Dr. C. B. McClelland, and the local committee had made ample provision for the social part of the program. The Chamber of Commerce kindly loaned their rooms for the place of meeting and also provided the Association with an excellent luncheon. After the luncheon short talks were given by some of the prominent citizens of Lawrence.

The address of welcome was given by the Hon. George L. Kreek, Mayor of Lawrence.

Dr. R. R. Dykstra responded to the address of welcome.

The President's annual address brought out considerable discussion, especially the topic relating to the spreading of knowledge to the non-graduate.

Those presenting papers were:

Dr. A. T. Kinsley, "Hemorrhagic Septicemia."

Dr. E. L. Hackney, "Clinical Diagnosis Between Hemorrhagic Septicemia and Anthrax."

These papers called forth much discussion, which bordered upon the subjects of hog cholera, forage poisoning, botulism, and corn stalk disease.

Dr. L. W. Goss, "Blackleg."

In the discussion of this disease Dr. Kinsley wanted to know the size of the dose recommended by Dr. Goss for the sheep, stating that he had posted three sheep that had died of blackleg in the one flock. Dr. Goss said that very little experimenting had been done by him in the sheep line, but that he thought it would be best to give about the same size dose of aggrassin to a sheep as one would give to a calf.

Dr. E. C. Cannon, "Tuberculosis in Live Stock."

The work of the B. A. I. in controlling this disease and the accredited herd and other phases of this disease was freely discussed.

Dr. George M. Potter, "Contagious Abortion."

The manner in which this disease may be spread and the means for the suppression and eradication of this disease was freely discussed. Dr. Kinsley said that in his estimation there was a great possibility of it being carried from an infected herd to a healthy herd by the milk or by-products of the milk. Dr. Potter thought that this means of spreading the disease was very remote, as most of the milk or its by-products were not fed to cattle after the milk or by-products were removed from the original farm.

Mr. H. Umberger, Acting Dean of the Extension Department, and in charge of the county agent work, spoke on the "Relation of the County Agent to the Veterinarian."

Mr. Umberger pointed out that there is a place for both, and if they work in harmony it will be to their mutual benefit. He thought that sometimes petty squabbles arose which were unjustifiable and he was in favor of doing all in his power to have a cordial relationship between both parties.

Dr. Dykstra's paper on "Sterility in Cattle" brought out much discussion along the lines of retained afterbirth, irrigating the uterus, the cost of properly treating a case of sterility, etc. It was thought that in many cases the value of a breeding cow was so close to the price of a beef cow that extensive treatment would not be justifiable. On the other hand, if it were a valuable breeding animal, one whose calf would be worth a big sum, then one would be justified in treating such an animal.

Dr. D. M. Campbell gave an interesting paper on "What I Would Do If I Were a Kansas Practitioner."

The Association gained twenty-seven new members.

The officers for the coming year are:

President—Dr. A. H. Gish.

Secretary-Treasurer—Dr. W. J. Guilfoil.

Executive Committee—Drs. I. G. Wimsett, G. H. Mydland and B. W. Conrad.

The next meeting will be held at Emporia, Kansas, about January 1, 1920. J. H. BURT, Secretary.

VETERINARY MEDICAL ASSOCIATION OF NEW YORK CITY.

The regular monthly meeting (which was also the annual meeting) of the Veterinary Medical Association of New York City was called to order by the Vice President, Dr. T. E. Smith, in the lecture room of Carnegie Laboratory, Wednesday evening, December 4, 1918, at 8:40 o'clock. The minutes of the November meeting were read and approved. Dr. J. F. De Vine of Goshen, New York, who has had an extensive experience and practice with pure-bred animals, and who is himself a breeder of fancy cattle, gave an interesting address on "Animal Breeding."

The Doctor first described the essential points and conformation of a good horse, demonstrating his remarks by an excellent chart. Next in order Dr. De Vine gave a very lucid and interesting description of the good points of a model dairy cow. In demonstrating his remarks the Doctor made use of a large photograph of the Holstein cow "O. K. L. Albina" and dwelt at some length on the proper type and conformation an animal should have to be a good breeder and milk producer.

Dr. De Vine then introduced Mr. Schmidt, the owner of "O. K. L. Albina," who gave an interesting history of this wonderful animal. Stated that in one year she gave over eleven tons of milk, or, to be exact, 22,273.6 pounds, and 962.6 pounds of butter. Said that he bought this animal for \$75 and under the good care given her at his farm she weighed 1,750 pounds before her first calf. Questioned as to how this animal was fed, he stated that she was fed a ration consisting of bran, hominy, oil meal and crushed oats, together with ensilage and beets. The milk tested 3.7%. On the 365th day of her milk test she gave 31 quarts. From four to six weeks after calving is the period of the best production.

Dr. Leo Price of the New York Department of Health then gave an interesting address on "Intradermal and Palpebral Tests for Glanders." The Doctor described these tests in detail and also stated that in 1,200 horses submitted for slaughter for food purposes, 75 were found on test to be glandered.

This being the annual meeting, the reports of all committees and election of officers was next in order.

Dr. Hoskins, Chairman of the Legislative Committee, said that he would endeavor to keep in touch with all legislative action and stated that the ruling of the Comptroller of the War Department regarding the status of the veterinarians in the army would have to be corrected by legislative action. Dr. Gannett stated that Dr. Downing had informed him that undoubtedly there will be a bill introduced in the State Legislature in favor of veterinary dentists.

Dr. R. W. Ellis, Chairman of the Programme Committee, said that they had succeeded in securing several good men as contributors to the programme during the past year and have the promise of others for future meetings.

Dr. Rohrer, Chairman of the Prosecuting Committee, reported progress.

Dr. Hoskins, Chairman of the Committee on Necrology, read resolutions regarding the death of Dr. Gill, which were, on motion regularly made, seconded and carried, ordered adopted, spread in full on the minutes, a copy sent to Dr. Gill's family and to the veterinary publications.

The accounts of the Secretary-Treasurer having been audited by the Auditing Committee, he reported a balance in the treasury of \$74.97. This report was regularly accepted.

The election of officers for the ensuing year then took place and resulted as follows:

Dr. David W. Cochran was unanimously elected President.

Dr. T. E. Smith was unanimously elected Vice President.

Dr. J. E. Crawford was elected Secretary-Treasurer.

From those nominated as Censors the following five gentlemen were elected: Dr. W. H. Hoskins, Dr. W. J. McKinney, Dr. R. S. McKellar, Dr. R. W. Gannett and Dr. T. E. Corwin.

The Secretary requested that a ruling on the question of dues be made, as at present the mode of procedure is unjust to new members joining the Association during the latter part of the year and being compelled to pay a full year's dues. Dr. Hoskins moved that dues be charged at the rate of 25 cents per month from the time of election to membership up to the beginning of the year. Seconded and unanimously carried.

Dr. R. W. Gannett offered the following as an addition to the Code of Ethics, to be known as Article X, viz:

"It shall be deemed a violation of the Code of Ethics for any member to solicit or accept a gift, gratuity or remuneration of any kind from a dealer in animals or his agent as a reward for passing animals for soundness or for recommending their purchase."

Dr. R. W. Ellis moved that a vote of thanks be extended to Drs. De Vine and Price and Mr. Schmidt for their valuable contributions to the program of the evening. Seconded and unanimously carried.

The retiring Secretary was also tendered a vote of thanks for his long term of service.

No further business appearing, the meeting adjourned.

R. S. MacKellar, Secretary.

FEBRUARY, 1919, MEETING.

The regular monthly meeting of the V. M. A. of N. Y. City was called to order in the lecture room of Carnegie Laboratory by President Cochran. The minutes of the January meeting were read and approved.

The president read a letter from Dr. Wm. H. Kelly, chairman of the legislative committee of the State Veterinary Medical Association, containing a copy of a bill introduced in both the assembly and senate amending the veterinary law. The new matter in the bill reads as follows:

"Any person who is more than 21 years of age, of good moral character, and who for at least 15 years prior to January 1, 1917, acted as an assistant to a duly licensed veterinary practitioner in the state, shall upon presenting to the State Board of Veterinary Medical Examiners satisfactory proof of these facts, together with a written endorsement by two duly licensed and practicing veterinarians of his knowledge of veterinary medicine, and his capabilities in the practice of the same, receive the recommendation by said board to receive from the regents, on payment of ten dollars, a license to practice veterinary medicine, which license, when duly issued by the regents, shall entitle such person to practice veterinary medicine in this state."

On motion, this bill was referred to the legislative committee.

It was generally moved, seconded and carried that the association as a body is opposed to this bill as special and vicious legislation, the secretary being requested to write Dr. Kelly, informing him of the action of the association.

Under the head of new business, Dr. R. W. Ellis said as this year was the twenty-fifth anniversary of the association, he thought it proper a convention should be held and suggested it be held during the month of June.

The president appointed Drs. Ellis, McKinney and MacKellar as a committee to consider the matter and report to the association.

It was regularly moved, seconded and carried that we hold a smoker and reunion some time during the month of March.

The president appointed Drs. MacKellar, W. I. McKinney and R. W. Ellis as a committee on smoker and reunion, to report at our next meeting.

Dr. Ellis brought up the matter of the identification of horses by the Health Department. He considered the ear tag as unsafe, cruel and unnecessary. Dr. McKinney said he had ear-tagged a number of horses lately with good results and said the manner in which it is done was important. Several others joined in the discussion. The consensus of opinion was that the ear tag should be replaced by some other means of identification by the Health Department.

Dr. Roy W. Gannett handed around a pathological specimen of an infected uterus from a Boston terrier bitch 6 years old, which he had removed before coming to the meeting. Both horns of the uterus were filled with pus.

Dean Hoskins read an instructive paper on "America's Danger in the New World Battle for Food." Dean Hoskins reviewed the appalling destitution that had accompanied the war, and the hunger problems which are sure to follow, unless the nation wakes up to the necessity of conserving the food supplies. He gave some startling facts with regard to agricultural conditions in New York State. He stated that out of 20,000,000 acres of farm land in the state, only 9,000,000 are under cultivation. We have more abandoned, idle and unprofitable farms than any other eastern state. In 1870 there were 5,000,000 sheep in this state, but in 1916 the number had fallen to 400,000. From five to seven million dollars' worth of animals are lost annually in the state from infectious and contagious diseases, which should be prevented by proper control through a system of veterinary sanitary police. The result of these conditions are that fifty per cent of the people of the state are without sufficient nourishment, and statistics showed that twenty-three per cent of the school children of this city are underfed. As a remedy for these conditions,

Dean Hoskins offered two main suggestions. First, that we should establish community abattoirs and food conservation stations. Second, that we should restrict our exports of food products so that the price levels in this country will fall within the reach of the average family. Dean Hoskins estimated that the application of these remedies would reduce the price of food fifty per cent.

This paper brought out a good discussion, which was joined in by Drs. Miller, McKinney, Gannett and others.

Dr. John F. De Vine then gave an interesting talk on "Breeding Problems." The Doctor handled this difficult subject in his well-known interesting and lucid manner and it was thoroughly enjoyed by the members and visitors.

The president mentioned the recent death of two of our members, Dr. F. H. Werner and Dr. Nathan Peyser. He requested the secretary to write a letter of sympathy and condolence to the families of our late brother members.

No further business appearing, the meeting adjourned at 11:30.

J. ELLIOTT CRAWFORD, Secretary.

CENTRAL CANADA VETERINARY ASSOCIATION.

The sixteenth annual meeting of the Central Canada Veterinary Association was held in St. Andrew's Hall, Ottawa, Ontario, on January 16. The meeting was held at this time to allow members to also attend the Ottawa Fat Stock Show and take advantage of the special rates provided by the railways.

The President, Dr. George Hilton, occupied the chair, and the meeting was called to order at 2:30 p. m., when the business of reading the minutes, electing officers, etc., was carried out.

Five new members were initiated into the good graces of the society.

The financial statement showed a fair balance on hand, despite numerous grants throughout the year for patriotic purposes, etc.

Dr. Hilton prefaced the general programme with remarks on the formation of the Advisory Board instituted to supervise and make recommendations for better veterinary education and legislation.

The afternoon session was given up to a discussion of subjects of interest to practicing veterinarians, the following papers being presented:

"Skin Diseases of Domestic Animals," Dr. A. E. James, Ottawa.

Hemorrhagic Septicemia of Cattle," Dr. N. M. Bellamy, Alexandria, Ontario.

"Cathartics in Cattle Practice," Dr. A. R. Metcalfé, Van-
kleek Hill, Ontario.

"Remarks on Braxy or Bradsot in Sheep," Dr. A. B. Wick-
ware, Ottawa.

The evening session brought forth some lively discussion rela-
tive to legislation, as well as an exposition of the following:

"Tuberculosis in the Dairy Cow," Dr. Higginson, Hawkes-
bury, Ontario.

"An Illustrated Address on Bots in Horses, Embodying
Features of the Life History," Dr. S. Hadwen, Ottawa.

"Hog Cholera," Dr. O. Hall, Ottawa.

"Vaccine Treatment of Contagious Abortion," Dr. J. C. Reid,
Ottawa.

All the foregoing papers were handled in a masterly manner,
giving evidence of careful and studious consideration.

A number of important resolutions were passed and plans
discussed for the holding of a summer clinic.

Dr. C. D. McGilvray, Principal of the Ontario Veterinary
College, spoke briefly upon the changes in the curriculum of that
institution, and the new system inaugurated for the clinical in-
struction of students.

Professor Daubigny and Professor Genereux were present as
representatives of Lavall University, Montreal, and delivered en-
tertaining addresses, in addition to taking an active part in the
general discussions. As a mark of esteem, the above three gentle-
men were unanimously elected honorary members of the Asso-
ciation.

Professor A. Dauth and Dr. Etienne were also present as
representatives of the Quebec Association, and were accorded a
hearty reception.

Dr. Dauth and Dr. Etienne are two of our never-failing
sources of welfare and inspiration, and furnish a profundity of
practical knowledge, lightened by good humor.

The dinner was held, as usual, between the afternoon and
evening sessions, and proved enjoyable in every way. Forty-two
members and guests participated, our festive board being graced
by the presence of the Rev. J. E. Lindsay, of Ottawa. The enter-
tainment committee provided many surprises, which were thor-
oughly enjoyed. Mr. Thomas Hamilton entertained with a reper-
toire of Harry Lauder's songs, being ably accompanied on the

piano by Mr. Hopkins, who also played many charming instrumental selections. The wee drop o' Scotch touched the taste-buds of our 'canny hie'land members, who audibly emitted gurgling sounds of delight. Mr. David Verner proved a veritable magician in his sleight-of-hand mysticisms, while Mr. Gordon Rogers appeared in his inimitable style in monologues and character sketches.

Many regular attendants were unable to be with us owing to the prevalence of influenza, and expressions of regret for their enforced absence were received, together with their best wishes for a successful meeting. Notwithstanding this unfortunate feature, the meeting was one of the best ever held, and augurs well for the future activities of the Central Canada Veterinary Association.

Officers for the current year were elected as follows:

Honorary President—Dr. F. Torrance, Veterinary Director General.

President—Dr. George Hilton, Ottawa.

Vice President—Dr. C. M. Higginson, Hawkesbury, Ontario.

Secretary-Treasurer—Dr. A. B. Wickware, Ottawa.

Council Members—Dr. Marriott, Dr. Hall, Dr. Hollingsworth, Dr. Barnes and Dr. James, Ottawa; Dr. W. C. McGuire, Cornwall, Ontario; Dr. A. G. Young, Almonte, Ontario; Dr. Langevin, Hull, Quebec.

Auditors—Dr. N. M. Bellamy, Alexandria, Ontario, and Dr. Kennedy, Ottawa, Ontario.

A. B. WICKWARE, Secretary.

LOUISIANA VETERINARY MEDICAL ASSOCIATION.

Monday, February 10, 1919, at 10 o'clock a. m., in the Association of Commerce, New Orleans, La., the Louisiana Veterinary Medical Association held a deferred meeting. Dr. Dalrymple was elected chairman pro-tem, then followed the election of permanent officers:

President—Dr. E. Pegram Flower.

Vice President—Dr. F. J. Douglass.

Secretary-Treasurer—Dr. E. I. Smith.

The president was authorized to appoint various committees to coöperate with the next meeting of the A. V. M. A. in New Orleans and in the meantime the association voted to admit all B. A. I. veterinarians in the state as honorary members.

A large number of men were present and President Flower announced there would be a regular meeting, with a literary program, called at an early date.

E. I. S.,

Secretary-Treasurer.

NEVADA VETERINARIANS FORM AN ASSOCIATION.

On January 30, 1919, twelve of the fifteen graduate veterinarians in the State of Nevada met at the Riverside Hotel, Reno, Nevada, and participated in a banquet, after which an association known as the Nevada State Veterinary Association was formed. The charter members of the association are: L. C. Butterfield, W. B. Montgomery, Edward Records, Geo. E. Bamberger, Robt. Dill, Stephen Lockett, F. H. Baker, R. C. Louck, Geo. L. Nicholas, J. E. Ast, W. E. Yancy, W. B. Earl, Geo. C. Taylor, L. H. Wright, Geo. M. Durkee.

The officers, who comprise the executive committee, are:

President—L. C. Butterfield, c/o Nevada Packing Company, Reno, Nevada.

Vice President—F. H. Baker, Gardnerville, Nevada.

Secretary-Treasurer—W. B. Earl, University of Nevada, Reno, Nevada.

No date was fixed for the second meeting, which will be held at Reno, Nevada, at the call of the executive committee.

W. B. EARL, Secretary-Treasurer.

CONFERENCE OF B. A. I. EMPLOYEES AT NEW ORLEANS.

The spirit that developed at the conference in New Orleans, February 11 to 13, of the employees of the Tick Eradication Division of the Bureau of Animal Industry was expressed in a resolution that said:

"We hereby pledge ourselves to greater efforts in the coming year, to the end that more cattle may be dipped, more ticks be eradicated, and a greater amount of territory be released from quarantine in 1919 than in any previous year."

This resolution was adopted after Dr. J. R. Mohler, Chief of the Bureau of Animal Industry, had told the fighters of the cattle parasite that they should "Make 1919 the Worst Year for the Tick," and after Governor Brough of Arkansas had declared that tick eradication is proving the salvation of agriculture in the South.

One way of helping to make 1919 the greatest in the campaign was impressed upon the tick fighters by Dr. R. A. Ramsay, Chief of the Tick Eradication Division. That method is, "Dip That Tick in March." Comparisons showing the greatly less infestation last summer in counties that began dipping early in the season were shown. "Two ticks in March mean thousands in June and millions later" epitomized the prolific productivity argument.

The tick eradicators met in conjunction with the Southern Cattlemen's Association, holding afternoon sessions while the cattlemen met in the morning. Members of each body attended sessions of the other. The cattlemen reiterated in resolutions their strong endorsement of tick eradication and urged the passage of a compulsory tick eradication law pending before the North Carolina legislature. The tick fighters in a resolution expressed their appreciation of the opportunity to meet with the Southern Cattlemen's Association "on this great occasion to further the development of the live stock industry in the South."

Among the speakers were Dr. Tait Butler, who first successfully demonstrated the practicability of tick eradication and who came to the conference to say that he expects to see a tick-free South within a few years; Dr. W. H. Dalrymple, professor of veterinary science in the University of Louisiana, who told the necessity of public confidence to make the campaign a success; Mayor Martin Behrman, who welcomed the tick men to New Orleans; Dr. W. F. Blackman, chairman of the Florida Live Stock Sanitary Board, who discussed the maintenance of morale in the tick eradication forces; State Senator Lee Cazort of Arkansas, who declared he was glad to be among the men who were "making the South tick-free;" W. A. Wallace of the Texas Live Stock Sanitary Commission, who urged effective state coöperation; Dr. E. Pegram Flower, Louisiana State Veterinarian, who described the benefits of the tick eradication law in Louisiana; P. P. Garner, commissioner of agriculture and chairman of the Mississippi Live Stock Sanitary Board, who told how Mississippi cleaned out the tick and said the accomplishment would have been impossible without Federal help; and Dr. C. A. Cary, state veterinarian of Alabama, who said that the new compulsory dipping law in Alabama will expedite the work in that state.

Among the Bureau men who spoke or led discussions were Dr. B. H. Ransom and R. M. Chapin, of Washington, D. C.; Dr. E. L. Bertram, National Stock Yards, Illinois; Dr. Flavus

Weaver, Mississippi; Dr. Z. C. Boyd, South Carolina; Dr. Sid Galt, Texas; Dr. C. J. Becker, Alabama; Dr. G. W. Rosenberger, Georgia; Dr. John E. Bender, Alabama; Dr. E. L. Wilson, Oklahoma; Dr. W. H. Beck, Texas; Dr. S. V. Ramsay, Florida; Dr. L. M. Buffington, Arkansas; Dr. W. K. Lewis, South Carolina; Dr. Edward Horstman, Louisiana. F. W. P.

Dr. W. R. O'Neal has moved from Newman, California, to 93 Belmont Avenue, Fresno, California, where his son, Dr. F. L. O'Neal, will be associated with him in practice.

NECROLOGICAL.

LIEUTENANT NATHAN W. ROBIN.

Lieutenant Robin died at Camp Wheeler, Georgia, on November 3, 1918. He was born at Slonin, Russia, in 1891. He graduated from the Chicago Veterinary College in 1915, and joined the A. V. M. A. in 1918. Before entering the army, Dr. Robin was connected with the Whipple Veterinary Hospital at Peoria, Illinois. His body was brought to Peoria for interment.

DR. FREDERICK H. WERNER.

Dr. Frederick H. Werner of New York City died January 30, 1919, after a brief illness, at the age of 42.

Dr. Werner was a graduate of the Veterinary Department of New York University, class of 1901. He had built up a very extensive practice in the Yorkville section of the metropolitan district. He was a 32nd degree Mason, and also an active member of the Order of Elks. A widow and two daughters survive him.

REVIEW.

ATLAS OF THE VISCERA, IN SITU, OF THE DAIRY COW.

GRANT SHERMAN HOPKINS, New York State Veterinary College, Cornell University, Ithaca, N. Y. (\$1.75. Publishers, The Macmillan Company, New York, 1918.)

The purpose of the author has been to meet the needs of the veterinarian and the veterinary student by exhibiting in concise and graphic form the location and relations of the digestive, respiratory, and genito-urinary organs of the dairy cow, which he has admirably succeeded in through ten beautifully executed plates reproduced from photographs of the cadaver suspended in normal position, and with the different organs exposed in situ. Important blood vessels are colored so as to stand out in contrast to their surroundings, which makes them easily distinguishable.

Related to each of the ten plates is a key index which enables the student to locate at once the different organs exhibited. In addition, there are 23 pages (8 x 5½) of reading matter descriptive of the different viscera, their attachments and relations, forming a lucid text on the subject, the whole showing a great amount of patience and attention to detail on the part of the author, which we feel is sure to be appreciated by both student and practitioner who wishes to become more perfect in the anatomy of the systems of the cow treated by the author.

Dr. Hopkins is to be congratulated on this excellent piece of work, which we consider of great value for the purpose he has intended it, and the publishers have executed their part well, as is their wont. If any criticism might be made, it would be, that such excellently prepared text and illustrations, etc., are worthy of a more substantial cover.

W. H. D.

FORTIFYING THE SWINE INDUSTRY

Pitman-Moore Anti-Hog Cholera Serum—through its purity, potency and being administered only by licensed, graduate veterinarians—has established a definite method of treatment for positively preventing this disease.

Six years of unqualified success has created such a demand that we are doubling our production facilities. Our greater facilities, with our conveniently located branch houses from which we also make day and night shipments, assure veterinarians of satisfactory service.

You will also be interested in our plan of issuing Individual and Herd Certificates of Treatment. Write us for information about it.

PITMAN-MOORE **Anti-Hog-Cholera Serum**

Prepared only at Moreland Biological Farm

Sold to and administered by graduate veterinarians only

HARRY C. MOORE, President

PHARMACEUTICAL AND BIOLOGICAL CHEMISTS

111-117 N. Capitol Avenue

Indianapolis, Indiana

WANTED!

GOOD VETERINARIANS ALL OVER THE COUNTRY TO USE THESE PRODUCTS

GERM-FREE BLACKLEG VACCINE (Immuno) An aggressin product made from calves, not a cheap, artificially made product. One treatment insures lasting immunity.
Price: 25 cents per dose.

BLACKLEG SERUM (Kuro) Has high curative properties. Every Veterinarian should keep some on hand.
Price: 1½ cents per c.c.

PURITY ANTI-HOG CHOLERA SERUM. High in potency. Reasonable in price.
Price: 1¼ cents per c.c.

WANTED: Agents to represent us in all unoccupied territory.

ALL PRODUCTS MADE UNDER U. S. VETERINARY LICENSE NO. 39



Send for booklets { "Blackleg and Its Prevention"
 { "Hog-Cholera and Its Prevention"

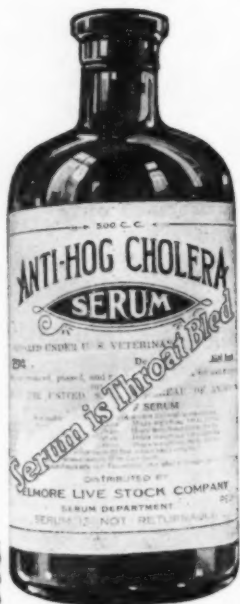
PURITY BIOLOGICAL LABORATORIES.
SIOUX CITY, IOWA

MR. VETERINARIAN

WHY NOT USE

THE "DEPENDABLE SERUM"

WITH A REPUTATION?



IT'S
THROAT
BLED!

Produced Up to a Standard

Not Down to a Price



Made Under United States

Government Supervision

And Sold to Veterinarians

Only

—DISTRIBUTED BY—

ELMORE LIVESTOCK CO.

R. D. CLARKE, President A. T. PETERS, D.V.M., Gen. Mgr.

PEORIA,

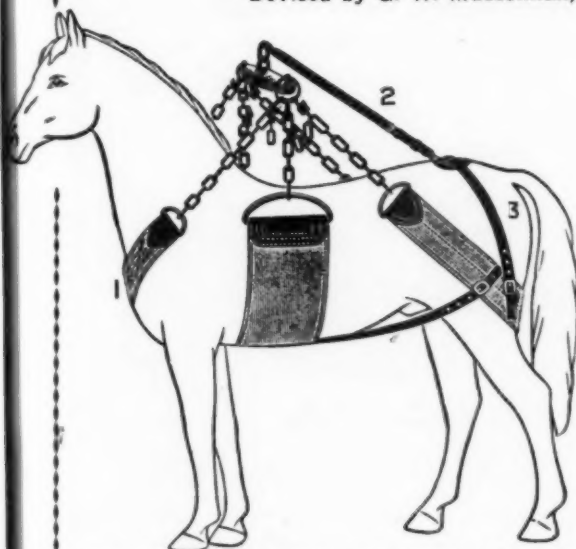
P. O. BOX NO. 43

ILLINOIS

DAY AND NIGHT SERVICE

Anatomically Correct MUSSELMAN'S IMPROVED COMFORT HORSE SLING

Devised by G. W. Musselman, Denver, Ind.



This apparatus is a boon to the profession, a decided improvement over anything yet invented to serve the desired purpose. The manner in which it has been constructed relieves all abdominal pressure, allowing no impediment to circulation or peristalsis. Animals suffering from diseases where dyspnoea is a marked symptom are not additionally embarrassed, and mares in advanced pregnancy are suspended without any undue inconvenience. One remarkable point is the apparatus can be adjusted to any size animal, and is strong enough to support the heaviest patient. Chiefly a triangular piece of canvas

runs forward between the anterior limbs, then divides, each end terminating in a chain attached to a single tree, suspending from the roof, allowing approximately two-thirds of the body's weight to rest comfortably yet securely.

The improved feature of this sling is the triangular piece of canvas running forward between the anterior limbs (see Fig. 1), which, being made narrower than the old-style Musselman's Sling, passes in between the shoulder joints, omitting soreness from rubbing; this was the only defect found on the old-style Musselman's Sling. We have also added hip straps (Figs. 2 and 3), which are a slight advantage in balancing horse, but hardly necessary.

If not in possession of our 400-page illustrated descriptive Catalog C, 13th Edition, send for same today; you need it and it's free.

SHARP & SMITH

Manufacturers of

High Grade Veterinary Instruments and Supplies

65 E. LAKE STREET

Between Michigan and Wabash Aves.

Established 1844. Incorporated 1904.

Chicago, Ill.

Chlorazene and Dichloramine

These remarkable new Chloramine antiseptics were introduced to the medical profession in America by The Abbott Laboratories and we still lead in their manufacture. These are giving excellent results in the treatment of fistulous withers, poll-evils and similar infected conditions. Send for booklet on Chlorazene and Dichloramine-T in Veterinary Practice.

Lobeline Sulphate

*A Prompt and Powerful Hypodermic,
Antispasmodic, Relaxant and Sedative*

Indicated in spasmodic colic, tetanus, strychnine poisoning and to allay excitement in azoturia and similar conditions. Include some in your next order.

PRICES:

Per tube of 12 1-4-grain tablets.....	\$1.08
Per tube of 12 1-20-grain tablets.....	.35
Per tube of 12 1-10-grain tablets.....	.53
Per tube of 25 1-60-grain tablets (for dogs).....	.30

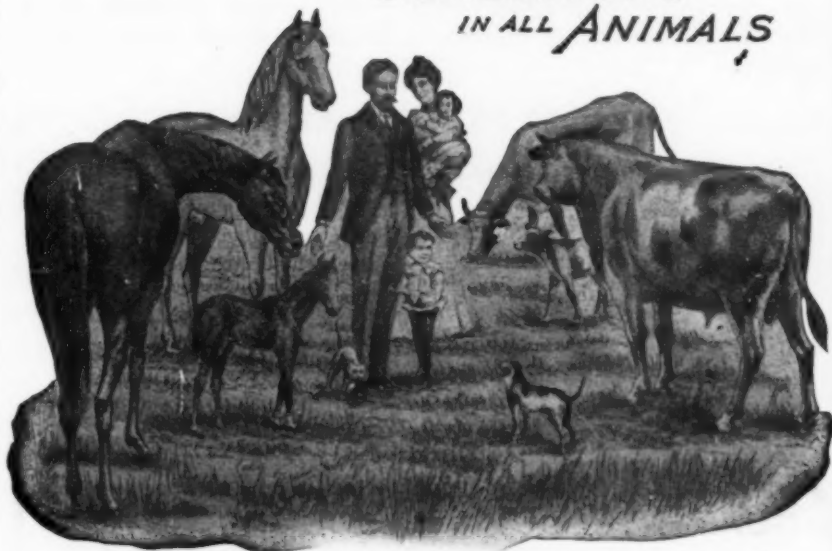
The Abbott Laboratories

HOME OFFICE AND LABORATORIES: CHICAGO, DEPT. 30

New York Seattle San Francisco Los Angeles Toronto Bombay

Sanmetto

FOR THE
GENITO-URINARY
CONDITIONS
IN ALL ANIMALS



[The Tender-Hearted Veterinarian with Wife, Daughter and little Son in the midst of his Patients that seem to reciprocate his kindness.]

A POSITIVE REMEDY
—IN—
DISEASES OF THE GENITO-URINARY ORGANS
—OF—
THE HORSE AND DOG AS WELL AS MAN

Doctor, when you have a Horse or Dog suffering from Kidney, Bladder or Urethral Trouble; or from any Irritation or Inflammation of the Urinary Tract; or from Impotency or Sterility,

ORDER SANMETTO

Sanmetto is largely used in Veterinary Practice for the above troubles and has been found Worthy and Reliable. It is also strongly endorsed and much used in AZOTURIA—many cases reported cured with it. Sanmetto acts as a vitalizing tonic to the Genito-Urinary Organs. It is eliminated from the System almost entirely through the Kidneys and Bladder—hence its soothing, healing and tonic power upon the entire Urinary Tract.

To avoid substitution, order thus: R, SANMETTO—one bottle—original package.

DOSE:—For Horse, one ounce three times a day. For Dog, one teaspoonful three times a day.

Price One Bottle, \$1.00. Case of One Dozen Bottles, \$8.00. Sold by all Reliable Druggists
Pamphlet on application to **OD CHEM. COs New York.**

SWAN-MYERS'

Abortion Bacterin

(BOVINE)

One, 3-vial Pkg., one 3-dose treatment.....\$.75

One, 6-mil Syringe, one 3-dose treatment..... 1.00

Used by the leading veterinarians in the principal dairy districts of the United States and Canada. If you expect results specify:

"SWAN-MYERS' VACCINES"

They are recognized as standard everywhere.

SWAN-MYERS COMPANY

Pharmaceutical and Biological Laboratories

INDIANAPOLIS

INDIANA

U. S. A.

GUARANTEED TO GIVE SATISFACTION



M·A·C

Mistura

Argent

Composita

Accepted and used by the Veterinary Profession since 1900
For Splints, Spavins, Curbs, Side Bones, Shoe Bolls, Ossifications, Inflammations, Tendons, Bursas, Lameness, Etc.

ADVANTAGES

Can be applied in a few seconds.
Does not soil the hands.
Does not blanch the horse.
Horse may be used every day.
Lower in price than imitations.
Guarantee label may be detached leaving only your name.

WE TAKE THE RISK

If "M-A-C" Fails
on Fairly Selected
Cases We Will Re-
place Your Loss.

PRICES

Single Bottle	\$ 2.00
1/4 doz. and one free	5.00
1/2 " " two "	8.00
1 " " four "	15.00
2 " " eight "	25.00

MANUFACTURED AND
FULLY PROTECTED BY

CARTER-LUFF CHEMICAL CO.,

"VETERINARY PHARMACEUTICALS"

HUDSON,
N. Y.

WRITE FOR OUR CATALOGUE

Pasteur Laboratories of America

BIOLOGICAL PRODUCTS

☐ THERE HAS NEVER BEEN ANY QUESTION ABOUT THEIR ABSOLUTE SUPERIORITY. WHY NOT USE THE BEST?

☐ *PASTEUR'S* original and genuine *ANTHRAX VACCINE* is now furnished in *single* and double treatment. It positively prevents anthrax.

☐ Profs. Leclainche & Vallee's Liquid Blackleg Vaccine is a true and perfectly attenuated vaccine, and has revolutionized livestock vaccination. Why risk your professional reputation with makeshift blackleg vaccine?

☐ Full information regarding the above, as well as Tuberculin, Mallein, Antitetanic and Antistreptococcic Serum, etc., furnished on request.

Pasteur Laboratories of America

New York, - - 366-368 W. 11th St.

Chicago, - - - 17 N. La Salle St.

Laboratoire des Vaccins Pasteur, pour l'Etranger and Institute Pasteur, Paris, France, Biological Products.

Abortions Reduced 80%

Losses from Contagious Abortion of Cattle Greatly Lessened

In preventing infectious or contagious abortion of cattle (Bang's disease), Bland, of Oxfordshire County, England, reports excellent results with **living** cultures of abortion bacilli.

In one infected herd of 559 animals, an abortion rate of 28% was **reduced to 6%**, among those animals immunized with living cultures.

In another large infected herd, of over 1000 animals, a 30% abortion rate was **cut to 5%**, among those animals immunized with living cultures.

Of 237 animals immunized with living cultures in 1911-1913, only 6 (less than 3%) could be traced to have aborted in 1914-1916, indicating that the immunity usually is durable.

For immunizing **non-pregnant** cows and heifers in **infected** herds, use

Mulford Brand Bovine Abortus Serovaccine

A single-dose injection of 20 mils (c.c.) containing 1000 billion sensitized **living** bacilli.

Furnished in 20-mil vials.

For the treatment of **pregnant** animals and **non-infected** herds, we offer

Mulford Brand Bovine Abortus Serobacterin

Containing sensitized **killed** bacilli. May be used as a four-dose, two-dose or single-dose treatment.

Furnished in packages of four 5-mil (c.c.) vials, each containing 250 billion sensitized killed bacilli (1 treatment).

20-mil (c.c.) vials, containing 1000 billion sensitized killed bacilli (1 treatment).

Mulford Brand Bovine Anti-Abortus Serum

Is a sterile (germ-free) product, containing specific anti-bodies against contagious abortion bacilli. It confers a passive immunity, lasting one to two months. Dose, 30 to 90 mils (c.c.).

Furnished in 100-mil (c.c.) bottles.

If cattle in your community are infected with contagious abortion, learn more about these new products.

Write for information and prices to

H. K. MULFORD COMPANY

Manufacturing and Biological Chemists

Philadelphia, U. S. A.



33915



INFECTIOUS ABORTION

Infectious abortion in cows is ascribable to a small bacillus, or *Bacillus abortus*, which was isolated as the specific organism for this disease by Bang in 1897. The organism has been demonstrated almost invariably where the disease has sprung up.

The possibility of steady transmission is great under unhygienic and unsanitary conditions, inasmuch as the organism, while readily killed by antiseptics, nevertheless remains alive for a considerable length of time under favorable conditions; as, for instance, in the foetal membranes and uterine secretions.

Much work on the prophylactic treatment of the disease has been accomplished in Central Europe, Great Britain and America, in which countries the disease assumes serious proportions from time to time. In America the bacterin has been of great value, when mass injections are used, and when accompanied by suitable sanitary measures. To obtain satisfactory results, it is necessary to use a large and highly concentrated dose of the bacterin at intervals of about seven days, and, where possible, to inject it about the fourth month of pregnancy.

Eagle Infectious Abortion Bacterin, Three Dose Treatment.....\$2.00

Eagle Hemorrhagic Septicemia Bacterin.....	{	5 Doses, \$1.25
	{	10 Doses, 2.50

Eagle Swine Plague Bacterin.....	{	5 Doses, \$1.25
	{	10 Doses, 2.50

Eagle Complicated Swine Plague Bacterin.....	{	5 Doses, \$1.25
	{	10 Doses, 2.50

Price subject to discount. All inquiries as to the treatment of diseases with bacterins, as well as bacteriological diagnosis, will be given our personal attention. Address inquiries and orders to

EAGLE LABORATORIES

HURON PARK, KANSAS CITY, KANSAS.

Hemorrhagic Septicemia

Hemorrhagic Septicemia, like hog cholera (before the use of serum) is becoming more prevalent among calves and cattle each year. It is especially common among cattle that have passed through some of the stock yards of the country. The relation of this disease to the corn crop (in some localities) is quite different from hog cholera, as hog cholera seems to be more prevalent during the feeding of green corn, while Hemorrhagic Septicemia seems to be the most prevalent after turning the is a small rod-shaped bipolar bacillus, the *Bacillus bovisepiticus*, which is a typical member of the group of hemorrhagic septicemia organisms or the so-called Pasteurella group. Good results have been obtained through the vaccination of cattle with Hemorrhagic Septicemia Bacterin before shipping from public stock yards, and also before turning cattle on corn stalks.

The success of the bacterin treatment against Hemorrhagic Septicemia depends on the use of bacterins containing large numbers of different strains of bacteria isolated from various parts of the country, thus enabling the bacterin to stimulate antibody production against any strain of Hemorrhagic Septicemia.

Eagle Hemorrhagic Septicemia Bacterins contain a variety of strains of bacteria drawn from various parts of the United States. We recommend the use of Eagle Hemorrhagic Septicemia Bacterin in the following dosage:

As a prophylactic—2 c.c. is the dose.

In the case of exposed or infected cattle—2 c.c. followed in 5 days with 2 to 4 c.c.

Eagle Hemorrhagic Septicemia Bacterin for cattle and swine in 5 dose packages—\$1.25.

Eagle Mixed Infection Bacterin for swine in 5 dose packages—\$1.25.

All orders and inquiries for discounts should be addressed to the home office, 512 Portsmouth Building, or to the following:

OKLAHOMA: Eagle Biological & Supply Company, Oklahoma City.

OHIO: Dr. W. G. Cook, Findley.

Dr. P. M. Cook, Washington Court House.

INDIANA: Dr. B. M. Goodman, 705 Merchants Bank Bldg., Indianapolis.

EAGLE LABORATORIES

512 Portsmouth Building, Huron Park

KANSAS CITY, . . . KANSAS

ANTI-INFLUENZA SERUM

BEEBE

FOR THE CURE OF INFLUENZA, STRANGLES
AND SHIPPING FEVER IN HORSES



It has been conceded by the best authorities on the subject that the serum treatment is the logical mode of proceeding in Influenza cases. When you administer this serum you are actually placing at the animal's disposal great quantities of Anti-bodies which are antagonistic to the invading organism.

PRICES

Package of 6, One Dose Vials (10cc) \$3.00

BEEBE LABORATORIES, INC.

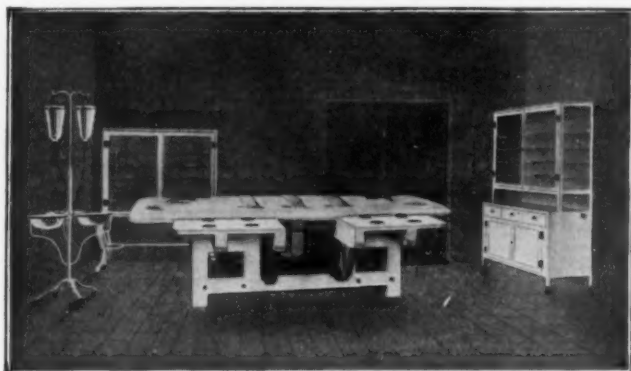
SAINT PAUL, MINNESOTA

\$150.00--Special for Thirty Days Only--\$150.00

F. O. B. HAMMOND, IND.

This offer absolutely expires as soon as the materials on hand are used up and sold. The Chicago Equine Operating Table is inexpensive in cost and inexpensive in the up-keep.

PLACE YOUR ORDER NOW!



"NO UP TO DATE
VETERINARIAN
SHOULD BE WITH-
OUT A CHICAGO
VETERINARY
TABLE"

"IT IS SO STRONG
AND WELL BUILT
THAT IT WILL
NEVER WEAR
OUT"

SIMPLE, STRONG, DURABLE AND PRACTICAL

We will also sell the castings and other parts separately. Write for our new, large Veterinary Catalogue, showing a complete line of the latest improved instruments and appliances.

FRANK S. BETZ CO. HAMMOND, INDIANA

Fowler's Serum VETERINARIANS



WHO VACCINATE HOGS

will find the Pass Word in the
realm of a Satisfied Clientele to be

FOWLER SERUM

Distributing our Serum through 100 branch houses, 'we offer
you unexcelled Service as well as dependable Serum and Virus at
all times.

Convince yourself by giving us a trial order.

Send your order to any Armour and Company
branch house, located in the principal cities

Fowler Serum Company

Kansas City, Kansas

Blackleg Filtrate--Lederle

RESULTS WITH BLACKLEG FILTRATE

Substantiated by Professor Naoshi Nitta of the Laboratory of Veterinary Pathology and Bacteriology, Tokyo Imperial University.

In the July issue of the Journal of the American Veterinary Medical Association, an article appeared by Professor Naoshi Nitta, in charge of the Laboratory of Veterinary Pathology and Bacteriology of the Tokyo Imperial University, on "Investigations on Blackleg Immunization," in which the results of extensive experimental work with the various blackleg products are reported with the following conclusion:

"The filtrate of a pure culture of the blackleg organism confers a solid immunity on animals treated and it has been already successfully used in thousands of cattle in infected districts. It is inexpensive, the material for the preparation being aerobic cultures of the organism in meat-piece broth, and its injection is not accompanied by the least danger, because the filtrate is quite germ-free."

Furthermore, it is stated in the article that Blackleg Filtrate alone is now being employed in Japan and Korea for vaccination against blackleg. The Lederle Antitoxin Laboratories were the first to prepare Blackleg Filtrate in the United States and further develop it to the present state of perfection.

The claims of superiority of Blackleg Filtrate over all other products by Professor Nitta only substantiates the results attained with Blackleg Filtrate—Lederle in the United States.

Blackleg Filtrate—Lederle is supplied in the special Lederle vial in three different size packages as follows:

Package containing 10 c.c. (10 doses).....	\$ 2.00
Package containing 50 c.c. (50 doses).....	8.00
Package containing 100 c.c. (100 doses).....	15.00

LEDERLE ANTITOXIN LABORATORIES

NEW YORK

Orders or inquiries for discounts should be addressed to our General Selling Agents, Messrs. Schieffelin & Company, 170 William Street, New York, or to one of the following branches:

CHICAGO:
839-841 Marshall Field
Annex Building

KANSAS CITY:
Firestone Building
20th St. and Grand Ave.

NEW ORLEANS:
1120 Maison Blanche
Building

OAKLAND, CAL.:
The Western Laboratories,
24th St. and Broadway

OTTAWA CANADA:
80 Elgin St.

NEW INSTRUMENTS

KOON'S IDEAL MILK TUBE



(Patent applied for)

This tube is used after an operation on the teat.

When a plain milk tube is used, the constant drain of the quarter very often spoils it. On the other hand, if a tube is inserted for drainage twice a day, the teat does not heal properly.

The Koon Ideal Milk Tube is inserted after the operation and left until the teat is healed enough so there is no danger of it closing, and as it is made of sterling silver, there is no danger of infection. The screw cap is taken off when you desire to drain the udder without interfering with the healing process. In a case of lacerated teat into the milk duct this tube need not be removed until well.

It can be used in all ways where a regular milk tube is used.

Length of tubes, $2\frac{1}{2}$ in., 3 in. or $3\frac{1}{2}$ in.

Price of tube, Sterling Silver, each \$1.00, per dozen \$9.00.

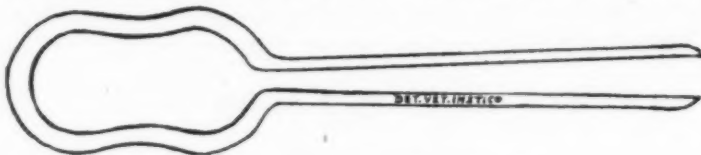
COMBINATION TUBE



Used for cauterizing the teat after the use of a bistoury or tumor remover. It can also be used in all cases the same as a regular milk tube. The hub on the end is the same as on a hypod. needle and can be used on all slip syringes.

Combination tube, each 50c, per dozen \$5.00.

DR. STEFFEN'S AUTOMATIC TEAT DILATOR



(Rights retained by Dr. M. R. Steffen)

The above Dilator is the only perfect dilator ever designed, or, in other words, it is anatomically correct.

It is made on the order of a spring, which gives a constant dilation at all times and makes it self-retaining.

As Dr. Steffen is the highest authority on cattle practice, it is useless for us to tell how perfect his dilator is.

Order one today.

Price, complete with directions, postpaid, each 75c, per dozen \$7.00.

The Detroit Vet. Instrument & Supply Co.

33-37 Congress St., W.

DETROIT, MICHIGAN

Laboratories

AND

Laboratory Methods

When laboratories and laboratory methods are being discussed by scientific men who know what they are talking about, The Cutter Laboratory of Berkeley, California, has more than "honorable mention."

It stands out as "The Laboratory That Knows How"—not only how to conduct laboratory processes, by reason of its twenty years' devotion to the production of "Biologies Only," but—

It also knows how to stand four-square on the proposition that there is only one best way to do a thing, and that is the only way thinkable or permissible, regardless of extra cost in time and material.

That is why we do not compete in time or in price with laboratories which make autogenous vaccines "while you wait."

With a variety of culture media which is amazing in the delicate shading off and gradation of one into another, we coax into vigorous growth organisms that either quickly die, or grow feebly, when cultured on the unfavorable soil of the stereotyped forms of media in general use.

So, whether it is an autogenous or regular stock vaccine, or whether it is one of the serums, specify "Cutter's" and you will get the best that experienced specialization and conscientious endeavor can make.

Veterinary Vaccines and Serums are prepared with the same care and scientific skill as products for Human use and are uniformly dependable.

Bacterial Count of Cutter Vaccines, or Baeterins, is in the vaccine, not on the label, and the same may be said of the organisms represented. We have examined Vaccines of absurdly high count (on the labels) which not only did not contain within billions of the count claimed, but also did not contain the organisms called for by the label.

Specify "Cutter's" always, but, better still, order direct from The Cutter Laboratory, Berkeley, California, or Chicago, Illinois; you will get products true to label, made by

"THE LABORATORY THAT KNOWS HOW"

Cutter Biologics

Besides the products especially advertised on other pages of this Journal, there are a number of other tried Cutter Biologics for Veterinary Use.

Our "Veterinary Price List and Therapeutic Index" gives concise information concerning them, and we shall be glad to mail it to Veterinarians on request.

Special Booklets giving more complete information concerning the principal products will also be sent on request.

OUR VETERINARY LIST COMPRISES

Bacterial Vaccines

(Bacterins)

B. Abortus
Anti-Influenza (Equine)
Calf Scour (White Scour)
Canine Distemper
Canine Distemper Prophylactic
Hemorrhagic Septicemia—Cattle
Hemorrhagic Septicemia—Sheep
Hemorrhagic Septicemia—Swine
Mixed Pneumonia
Mixed Bacterins (Anti-Suppurine)
(Staph-Strep-Coli)
Poly. Mixed Bacterins
(Staph-Strep-Coli-Pneumo)
Streptococcic (Streptocine)

Mallein

Solution (ready to use)
Solution (ready to use syringe)
Tablets (Ophthalmic)

Tuberculin

Subcutaneous (ready to use)
Intradermal (ready to use)
Tablets (Ophthalmic)

Live Vaccines

Anthrax Vaccine
Anthrax Vaccine Simultaneous
B. Abortus Vaccine
Blackleg Vaccine—Pills
Blackleg Vaccine—Powder

Germ-Free Blackleg Vaccine

Cultural Filtrate
Tissue Aggressin

Serums

Anti-Anthrax
Anti-Blackleg
Anti-Calf Scour
Anti-Canine Distemper
Anti-Distemper and Influenza
(Equine)
Anti-Hemorrhagic Septicemia
Anti-Hog Cholera—Regular
Anti-Hog Cholera—Sterile
Anti-Tetanic

Instruments

Special Syringes, Thermometers
Blackleg Pill Injectors

Twenty years' exclusive devotion to Biologics Production count for something. Today, The Cutter Laboratory is the largest in the world devoted exclusively to Biologics Production.

Your Specification, or direct order, for "Cutter's" Biologics ensures that you get the best possible, made by

"THE LABORATORY THAT KNOWS HOW"

The Intradermal Test

IS O. K.

It's Just a Matter of Using the Right Tuberculin

And the Right Tuberculin is Cutter's

Cutter's Intradermal Tuberculin. was used in official tests of thousands of dairy cattle in California last year with results more satisfactory than were ever obtained anywhere with any other Tuberculin or any other method of testing.

Try "Cutter's" and verify the certainty of the test and the Tuberculin.

Prices—Intradermal Tuberculin	Net	List
Pkg. containing one 2 c.c. bottle (sufficient for 10 to 20 tests.)	\$ 0.33	\$.50
Pkg. containing four 2 c.c. bottle (sufficient for 40 to 80 tests.)	1.00	1.50

Prices—Regular Tuberculin	Net	List
Solution (ready for use) 2-dose bottles.....	.23	.35
Solution (ready for use) 5 dose bottles.....	.50	.75
Solution (ready for use) 10 dose bottles.....	.84	1.25
Solution (ready for use) 25 dose bottles.....	1.67	2.50
Syringe containing 1 dose ready to use.....	.33	.50

CUTTER'S MALLEIN

Is good enough for Uncle Sam. Thousands of doses have been used in testing horses and mules for Army use.

If you have testing to do, use "Cutter's" and be on the safe side.
You can bank on accurate results.

Prices	Net	List
Solution (ready for use) 1 dose bottle.....	.23	.35
Solution (ready for use) 5 dose bottle.....	.67	1.00

For the Ophthalmic Test

Package containing 1 test tablet.....	.17	.25
Package containing 5 test tablets.....	.34	.50

For the Intrapalpebral Test

Package containing four 1 c.c. vials.....	1.33	2.00
---	------	------

Send your orders direct to

The Cutter Laboratory

"THE LABORATORY THAT KNOWS HOW"

BERKELEY

CALIFORNIA

Or to The Cutter Laboratory, Chicago, Illinois

In California

Cutter's Anthrax Vaccine and Anti-Anthrax Serum are the recognized best insurance against losses from Anthrax.

They are used practically to the exclusion of all others by the best veterinarians, and in certain badly infected territory in Texas and Louisiana they gave positive protection where others failed.

To Prevent Anthrax, the Serum-Vaccine simultaneous method is recommended, though users who have had good results year after year from the use of Cutter's Anthrax Vaccine "alone," still continue this practice.

To Cure Anthrax.—Thousands of head have been saved during the last three years by the use of Cutter's Anti-Anthrax Serum in virulent outbreaks on badly infected land.

Write for Special Literature concerning these products, which are prepared in our new special Anthrax plant, the largest and most up-to-date in the world, devoted exclusively to the production of Anthrax Vaccines and Anti-Anthrax Serum.

Blackleg

The Kind of Vaccine to Use

When deciding what Vaccine to use, the following facts should be considered:

(1) Cutter's Blackleg Filtrate is a "Germ Free" Vaccine, a cultural product, that positively protects against Blackleg and is comparatively inexpensive.

(2) Cutter's Blackleg Aggressin is also a "Germ Free" Vaccine, made directly from animal tissues, and affords even greater protection than the Filtrate. It is recommended for Pure Breds.

(3) Neither the Filtrate, nor the Aggressin, can possibly produce Blackleg, since both are germ free.

(4) Both have given 100% protection even in bad blackleg districts where old type spore bearing has never fully protected.

(5) Blackleg Vaccine, Pill Form, "Cutter's" Blackleg Pills is the cheapest and most convenient vaccine to use and has successfully stood the test of time. The objections to the use of vaccine are the possibilities of occasional losses following vaccination

and at times a lack of protection in some of the vaccinated animals. But these objections are in large measure offset by the small cost of the Pills and the ease of their administration.

(6) Cutter's Serum-Vaccine Method.—This method is especially recommended in the control of outbreaks of Blackleg. Animals not visibly sick should be given serum in doses of from 20 to 30 c.c. (or 50 c.c. in very severe outbreaks), and followed in eight or ten days with Cutter's Blackleg Filtrate, Aggressin or Special Strength Blackleg Vaccine (Pill Form).

(7) Cutter's Anti-Blackleg Serum positively cures Blackleg. Sick animals should receive from 100 to 300 c.c. subcutaneously, or intravenously. Write for special Blackleg literature.

<u>Prices</u>	<u>Net</u>	<u>List</u>
Cutter's Blackleg Filtrate, 10 dose package (50 c.c.).....	\$1.33	\$2.00
Cutter's Blackleg Filtrate, 50 dose package (250 c.c.).....	5.33	8.00
Cutter's Blackleg Filtrate, 100 dose package (500 c.c.).....	10.00	15.00
Cutter's Blackleg Aggressin, 10 dose package (50 c.c.).....	2.20	3.30
Cutter's Blackleg Aggressin, 50 dose package (250 c.c.).....	10.00	15.00
Cutter's Blackleg Vaccine Pills—Single 10 dose package....	.67	1.00
Cutter's Blackleg Vaccine Pills—Single 50 dose package....	2.67	4.00
Cutter's Blackleg Vaccine Pills—Double 10 dose package....	1.00	1.50
Cutter's Blackleg Vaccine Pills—Double 50 dose package....	4.00	6.00
Cutter's Blackleg Vaccine Pills—Special Strength 10 dose pkg	.67	1.00
Cutter's Blackleg Vaccine Powder—Single 10 dose package..	.67	1.00
Cutter's Blackleg Vaccine Powder—Double 10 dose package..	1.00	1.50
Cutter's Anti-Blackleg Serum, 50 c.c. package.....	1.53	2.00
Cutter's Anti-Blackleg Serum, 500 c.c. package.....	10.84	16.25
Cutter's Blackleg Pill Injector.....	1.28	1.50
Cutter's 10 c.c. Syringe for Administering Filtrate, Aggressin or Serum.....	3.40	4.00
Cutter's 30 c.c. Syringe for Administering Filtrate, Aggressin or Serum.....	3.40	4.00
Cutter's 50 c.c. Syringe for Administering Filtrate, Aggressin or Serum.....	5.10	6.00

Full directions for use accompany all these.

N. B.—Cutter's Blackleg Filtrate is full 5 c.c., to the dose, as we believe that smaller doses, whether concentrated or not, afford less protection.

Send your orders direct to

THE CUTTER LABORATORY

"THE LABORATORY THAT KNOWS HOW"

BERKELEY

CALIFORNIA

Or to The Cutter Laboratory, Chicago, Illinois

Cutter's Anti-Hog Cholera Serum

When we commenced the production of this article we had back of us 20 years' experience in producing serums and viruses for human and animal use, and in that respect we were better qualified to produce Anti-Hog Cholera Serum and Hog Cholera Virus than laboratories which, while they had been producing these two articles for a few years, nevertheless lacked the experience in producing high-grade laboratory products that The Cutter Laboratory possesses.

That experience enabled us to plan, build up and equip what is conceded to be the most up-to-date and best-equipped plant in the world for the production of Anti-Hog Cholera Serum and Hog Cholera Virus.

Our record of several hundred thousand doses sold and used within the first year after production commenced, without one single complaint of bad results or lack of realization of expected good results, is also due to that same more than ordinary knowledge of the proper conduct of laboratory processes which our organization possesses.

The Cutter Laboratory produces the old type serum, but it also produces a clear, sterile serum from which the corpuscles and solid constituents of the blood have all been removed. This product is about 20 per cent more potent than ordinary defibrinated blood, as the inert matter consisting of corpuscles, fibrin, etc., has been removed. It is sterile, thereby adding to its keeping qualities and it may be injected without danger of the serum itself producing abscesses. Sterile serum is more promptly absorbed in the body tissues and on this account should give best results in the immunization of hogs against cholera.

But while we strongly recommend this refined product we nevertheless furnish the regular type with full confidence that it is the best of its kind.

Write for literature and prices.

THE CUTTER LABORATORY

"THE LABORATORY THAT KNOWS HOW"

BERKELEY

CALIFORNIA

Inquiries and orders may go to Berkeley, or Chicago,
according to your preference and convenience.

Cutter's Anti-Calf Scour Serum

Has given excellent results in the Prophylaxis and Treatment of Calf Scour and Calf Pneumonia.

Prophylactically, it should be used during the first 48 hours of the calf's life, in doses of 10 to 20 c.c.

Curatively, it should be used in doses of from 20 to 100 c.c.

<u>Prices</u>	<u>Net</u>	<u>List</u>
10 c.c. bottles.....	\$.50	\$.75
50 c.c. bottles.....	1.50	2.25
10 c.c. Syringe, ready-to-use.....	.67	1.00
Special package, 500 c.c., also furnished at.....	10.84	16.25

CUTTER'S CALF SCOUR VACCINE

May also be used in Prophylaxis and Treatment of Calf Scour and Calf Pneumonia, either alone or in addition to the Calf Scour Serum.

The dose is from 1 to 2 c.c.

<u>Prices</u>	<u>Net</u>	<u>List</u>
Package of six 2 c.c. bottles.....	\$1.00	\$1.50
Package of one 20 c.c. bottle.....	1.33	2.00

CUTTER'S B. ABORTUS VACCINE

For use in Prophylaxis and Treatment of Contagious Abortion in cows.

We guarantee "Cutter's" to be the best B. Abortus Vaccine possible to produce.

<u>Prices</u>	<u>Net</u>	<u>List</u>
Package of four 2 c.c. bottles.....	\$.67	\$1.00
<u>(1 full immunizing treatment)</u>		

MASTITIS VACCINE (for udder infections)

<u>Prices</u>	<u>Net</u>	<u>List</u>
Package containing six 2 c.c. vials.....	\$1.00	\$1.50
<u>Send your orders direct to</u>		

THE CUTTER LABORATORY

"THE LABORATORY THAT KNOWS HOW"

BERKELEY

CALIFORNIA

Or to The Cutter Laboratory, Chicago, Illinois

Navel Ill or Joint Evil

IN COLTS

Successfully Combated

WITH

Cutter's Staph-Strep-Coli Vaccine

(Anti-Suppurine)

Use it Prophylactically on new-born colts to protect against the common pus-producing organisms.

Use it as a Curative in existing cases of infection.

Prices	Net	List
Package of six 2 c.c. vials—regular dosage—per package.....	\$1.00	\$1.50
Package of one 20 c.c. bottle—regular dosage—per package..	1.33	2.00
Package of six 2 c.c. vials—serial dosage—per package.....	1.00	1.50

Other Indications for the use of Anti-Suppurine. Anti-Suppurine (Cutter's Staph-Strep-Coli Vaccine) will be found a valuable aid in the treatment of all suppurative conditions, such as fistulous withers, poll-evil, mastitis, abscesses, quittor, cellulitis, lymphangitis, surgical wounds, nail pricks, wire cuts, and following the acute stages in strangles and influenza.

CUTTER'S POLY-MIXED BACTERINS

A high-count Bacterial Vaccine in a ready-to-use Syringe

This Vaccine is practically the same as Anti-Suppurine, except that it contains killed Pneumococci in addition to the Staph-Strep-Coli combination.

The indications for its use are the same as for the use of Anti-Suppurine.

Price	Net	List
Package of 4 Syringes—ready-to-use.....	\$1.67	\$2.50

CUTTER'S ANTI-INFLUENZA VACCINE

Prepared from many freshly isolated strains of Streptococci (*S. equi*, Schutz) and Staphylococci from typical cases of equine distemper and influenza.

Indications.—Anti-Influenza Vaccine is indicated in the prophylaxis and treatment of equine distemper, strangles, influenza, shipping fever, and pneumonia, as well as all complications and sequelae of these diseases.

Prices	Net	List
Package of six 2 c.c. bottles.....	\$1.00	\$1.50
Package of one 20 c.c. bottle.....	1.33	2.00

CUTTER'S ANTI-DISTEMPER SERUM

A true, specific Anti-Serum for the treatment of and immunization against distemper and influenza (catarrhal fever, acclimation fever, "yards" fever) and all complications, bronchitis, coughs, strangles, etc., arising therefrom in horses and mules.

Price	Net	List
50 c.c. bottle.....	\$1.67	\$2.50

CUTTER'S Hemorrhagic Septicemia Vaccines

For Cattle, Sheep and Swine

Each Vaccine is prepared from many different strains of Hemorrhagic Septicemia producing organisms found in the particular animals for which the vaccine is intended.

Prophylactic Use

Inject each exposed animal with 2 c.c. of vaccine, subcutaneously. After an interval of five to seven days another injection of 2 to 4 c.c. may be given.

Curative Use

In the treatment of sick animals give from 1 to 2 c.c. of vaccine subcutaneously or intravenously.

<u>Prices</u>	<u>Net</u>	<u>List</u>
Hemorrh. Sept. Vaccine for Cattle		
Packages of six 2 c.c. bottles.....	\$1.00	\$1.50
Packages of one 20 c.c. bottle.....	1.33	2.00
Hemorrh. Sept. Vaccine for Sheep		
One 20 c.c. bottle.....	1.33	2.00
Hemorrh. Sept. Vaccine for Swine		
One 20 c.c. bottle.....	1.33	2.00
Special Prices will be made on large quantities.		

CUTTER'S Anti-Hemorrhagic Septicemia Serum (Bovine)

Has given very satisfactory results in the Prophylaxis and Treatment of Hemorrhagic Septicemia in Cattle.

Immunizing Dose 20 c.c.

Curative Dose 50 to 200 c.c., repeated as necessary.

<u>Prices</u>	<u>Net</u>	<u>List</u>
50 c.c. bottle.....	\$1.33	\$2.00
500 c.c. bottle.....	10.84	16.25

Send your orders direct to

THE CUTTER LABORATORY

"THE LABORATORY THAT KNOWS HOW"

BERKELEY

CALIFORNIA

Or to The Cutter Laboratory, Chicago, Illinois

CUTTER'S Canine Distemper Vaccine

Prophylactic

Is a suspension of the B. Branchisepticus for the prevention of Canine Distemper.

It should be administered in 2 c.c. doses at intervals of from 5 to 7 days.

<u>Price</u>	<u>Net</u>	<u>List</u>
3 bottles, one immunizing treatment.....	\$.50	\$.75

CUTTER'S Canine Distemper Vaccine

For Treatment

Is a Mixed Vaccine, containing B. Branchisepticus, Staphylococcus and B. Coli.

This vaccine has been used with considerable success in the treatment of Canine Distemper. The serum should also be used on valuable dogs.

<u>Price</u>	<u>Net</u>	<u>List</u>
Six 2 c.c. bottles, in serial dosage.....	\$1.00	\$1.50

CUTTER'S Anti-Canine Distemper

Serum

Is especially indicated in the Curative Treatment of Canine Distemper, either alone or in conjunction with the Canine Distemper Vaccine (for Treatment).

The dose is 10 to 50 c.c. according to the size of the dog.

<u>Price</u>	<u>Net</u>	<u>List</u>
50 c.c. bottle.....	\$1.67	\$2.50

Send your orders direct to

THE CUTTER LABORATORY

"THE LABORATORY THAT KNOWS HOW"

BERKELEY

CALIFORNIA

Or to The Cutter Laboratory, Chicago, Illinois

STRASENBURGH'S

Products are Reliable



If you haven't tried them, do so, for it will not only pay you to know one of the best firms to do business with, but you will be pleased with our products. Nothing enters into them but materials of the highest grade, coupled with our many years of experience, thus insuring you of results. And results count.

R. J. STRASENBURGH CO.
MANUFACTURING CHEMISTS
VETERINARY INSTRUMENTS

187-195 Exchange St., Rochester, New York

VETERINARY OBSTETRICS

BY W. L. WILLIAMS

Professor of Obstetrics and Research Professor of the Diseases of
Breeding Cattle, in the New York State Veterinary
College at Cornell University, Ithaca, N. Y.

*Six hundred and fifty pages, three full-page colored plates and
one hundred and forty illustrations in the text.*

Price, \$5.00 Prepaid, sold exclusively by the Author.

IN PREPARATION, by the same Author:

**Diseases of the Genital Organs of Animals,
Sterility, Abortion.**

Chicago Veterinary College

2533, 2535, 2537 and 2539 State St., Chicago, Ills.

Organized and Incorporated under the Laws of the State of Illinois, 1883.

Regular Session commences on or about Sept. 15th in each year

For Prospectus giving all information as to curriculum, fees, etc., address the President.

JOSEPH HUGHES, M. R. C. V. S.,

2537 and 2539 State St., Chicago, Ills.

NEW YORK STATE VETERINARY COLLEGE

Established at NEW YORK UNIVERSITY by Chapter 676, Laws of 1913
FORMERLY NEW YORK-AMERICAN VETERINARY COLLEGE
(New York College of Veterinary Surgeons, Chartered 1857, and
American Veterinary College, Chartered 1875)

FOUR YEAR GRADED COURSE

Session 1917-18 began Sept. 5, 1917

Applications for entrance received to September 26, 1918.

Free Scholarship to One Student from each Assembly District
Laboratory Facilities and Clinical Advantages Excellent

Write for New Catalogue and All Information to
W. HORACE HOSKINS, D.V.S., DEAN

338 East 26th Street

New York City

UNIVERSITY OF PENNSYLVANIA

SCHOOL OF VETERINARY MEDICINE

PHILADELPHIA

offers a complete course in veterinary medicine extending over four sessions, each beginning the last Friday in September and ending the third Wed., in June. Clinics and equipment unexcelled.

For catalogue and further information, address

LOUIS A. KLEIN, V.M.D., Dean Veterinary Faculty, Dept. G.

**MEN, MUNITIONS AND FOOD
WILL WIN THE WAR.**
It Takes Money to Provide Them
Invest in Liberty Bonds!

Indiana Veterinary College

CONFERS THE DEGREE OF

DOCTOR OF VETERINARY MEDICINE

WRITE FOR CATALOGUE

804 E. Market St.

Indianapolis, Indiana

NEW YORK STATE VETERINARY COLLEGE,

ESTABLISHED AT

CORNELL UNIVERSITY, ITHACA, N. Y.

BY CHAPTER 153, LAWS OF 1894.

This college is well equipped with modern facilities for scientific and practical instruction for undergraduates. Most varied practice for students in the free clinics. Regular graded course, four years of nine months each. Entrance by Regents' "Veterinary Student Certificate," or by examination, September, 1918. Matriculation September, 1918.

Tuition Free to New York State Students.

For extended announcement address,

Professor VERANUS A. MOORE, Director.

THE OHIO STATE UNIVERSITY

College of Veterinary Medicine

COLUMBUS, O.

Offers a four-year graded course leading to the degree of Doctor of Veterinary Medicine. Unexcelled laboratory and clinical facilities. New buildings especially designed for teaching veterinary medicine according to the most approved modern methods. Faculty and specialists devoting whole time to teaching. For College Bulletins address

DAVID S. WHITE, Dean.

ST. JOSEPH VETERINARY COLLEGE

Accredited by Federal Government

WRITE FOR CATALOGUE

Address, St. Joseph Veterinary College, Dept. 3, St. Joseph, Mo.

R. C. MOORE, President

E. A. LOGAN, Dean

THE GEORGE WASHINGTON UNIVERSITY

College of Veterinary Medicine, Washington, D. C.

A four year course leading to the degree of Doctor of Veterinary Medicine (D. V. M.), designed for young men employed in the government service or elsewhere during the day. Lectures begin at 5 p. m.

School recognized by American Veterinary Medical Association and U. S. Government.

Clinics, hospitals, military posts, government laboratories and experiment stations located at the National Capital give students superior advantages in acquiring a broad education in veterinary science. For catalogue, address

DAVID E. BUCKINGHAM, V. M. D.,

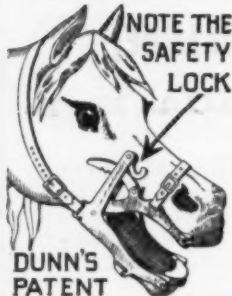
Dean of Veterinary Faculty, 2113-15 14th St., N. W.

VETERINARY LOCATIONS

Veterinary locations, positions and practices handled and furnished in all states. Drug stores for sale and positions in all states. Veterinarians, physicians, dentists, furnished for location and positions. F. V. Kniest, R. P., Bee Building, Omaha, Nebraska. Est. 1904.

DEBTS COLLECTED QUICKLY

Send your accounts today to a live wire firm and get your money now. Established 25 years. Collections made everywhere. William H. Dodd, 87 Nassau St., New York.



VETERINARY SURGICAL INSTRUMENTS
TEXT BOOKS AND SUPPLIES

Superior to All Others for Quality and Practicability.

DUNN'S "SAFETY" MOUTH SPECULUM

It is anatomically correct and provided with safety locks that prevent closing accidentally under any circumstances. The simplicity of the device is shown in the illustration. Besides the addition of the safety locks it has improvements that make it the Safest, Most Practical and Durable Speculum of this pattern on the market.

Price with cupped plates only.....\$12.50
Gum plates, extra, per pair..... 1.00

Complete.....\$13.50

FOR SALE BY

HAUSSMANN & DUNN CO.,

708 So. Clark St., Chicago

LET US TAN YOUR HIDE.

Horse or Cow hide, Calf or other skins with hair or fur on, and make them into coats (for men and women), robes, rugs or gloves when so ordered. Your fur goods will cost you less than to buy them and be worth more.

Our illustrated catalog gives a lot of information. It tells how to take off and care for hides; how and when we pay the freight both ways; about our safe dyeing process on cow and horse hide, calf and other skins; about the fur goods and game trophies we sell, taxidermy, etc.

Then we have recently got out another we call our *Fashion book*, wholly devoted to fashion plates of muffs, neckwear and other fine fur garments, with prices; also fur garments remodeled and repaired.

You can have either book by sending your correct address naming which, or both books if you need both. Address

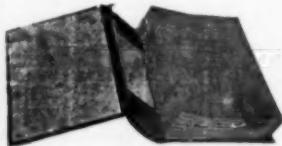
The Crosby Frisian Fur Company,
571 Lyell Ave., Rochester, N. Y.



THE COW
IN HEALTH AND DISEASE
The Book you have been wishing for.
By LIEUT. G. H. CONN, D. V. M.
\$1.00 Prepaid.
BURTON PUBLISHING CO.
509 East 9th Street Kansas City, Mo.

THE "BIG BEN" BINDER

The binding of magazines in this binder is as easy as filing papers. No punching of holes is necessary. The bound matter opens flat to any page, even more so that a regularly bound book.



Each binder holds one volume and any number can be readily removed if it is desirable to take a copy to a meeting, etc., to quote from. Put in each number as you get it and you have your numbers bound at the end of each volume.

Cloth with Go'd Lettering,
Price, \$1.00

Address Journal of the American Veterinary
Medical Association, Ithaca, N. Y.

Just Enough

and just as they want it. The right way to salt animals is to let them help themselves.

Compressed Pure-Salt Bricks

In our Patent Feeders, supply refined dairy salt. They mean animal thrift. They cost but little.

Convenient for you and your animals suffer no neglect. Ask your dealer and write us for booklet.

Belmont
Stable
Supply Co.
Patentees, 24 Ave.
Brooklyn,
N. Y.



M
cks
ces.
ion.
ve-
ble

go

E
for.
M.

Mo.

DER

binder
ling of
opens
a reg-

terinary
Y.

ANTIPHLOGISTINE

is a valuable aid to VETERINARIANS in
EQUINE BOVINE CANINE FELINE
PRACTICE

PNEUMONIA
TENDINITIS
SPRAINS
SCRATCHES
ORCHITIS
CAPPED KNEE

INFLATED GLANDS
ABSCESSSES
BRUISES
BURNS
BOG SPAVIN
HARNESS GALLS

yield promptly to
ANTIPHLOGISTINE

Applied hot and thick and covered with cotton.

SEND FOR BOOKLET AND SAMPLE.

The Denver Chemical Mfg. Co.

New York



Veterinary Phylacogens

PNEUMONIA PHYLACOGEN (Veterinary)—Indicated in the treatment of acute and chronic pneumonia and their complications. Administered hypodermically.

Bio. 950. Bottles of 30 mls. List price, per bottle, \$1.50.

MIXED INFECTION PHYLACOGEN (Veterinary)—Indicated in the treatment of strangles, abscesses, quitters, fistula of the withers, poll evil, pyemic arthritis, scirrhus cord and all other suppurative conditions. Administered hypodermically.

Bio. 960. Bottles of 30 mls. List price, per bottle, \$1.50.

Veterinary Phylacogens have been used all over the world with distinct satisfaction. Only in a small percentage of cases, when administered as indicated, have they failed to produce the desired results. Given a correct diagnosis, success with Phylacogens may be confidently expected.

Home Offices and Laboratories,
Detroit, Michigan.

PARKE, DAVIS & CO.

Equine Cough Syrup

FOR EQUINE, BOVINE AND CANINE DISEASES
OF THE RESPIRATORY TRACT.

Each fluidounce represents:

Spirit Nitrous Ether, 64 minims.
Morphine Acetate, $\frac{1}{4}$ grain.
Chloroform, 4 grains.
White Pine Bark, 32 grains.
Grindelia, 32 grains.
Wild Cherry Bark, 16 grains.

Balsam Poplar Buds, 8 grains.
Sanguinaria, 4 grains.
Eriodictyon, 4 grains.
Sassafras Bark, 4 grains.
Alcohol, 14 per cent.
Eucalyptol and Honey, q. s.

EQUINE COUGH SYRUP is efficacious in the treatment of all inflammations of the air passages in which cough is a notable symptom. Not only does it allay cough, but it checks the progress of the pathologic condition of which cough is the chief symptom.

SOME INDICATIONS.

Influenza, Strangles, etc.

A few doses in the early stages usually abort the cough.

Acute Bronchitis.

Highly serviceable when cough is troublesome and the irritable membrane dry and vascular.

Laryngitis and Pharyngitis.

Particularly useful in the early stages.

Chronic Cough following Influenza.

Give the syrup at regular intervals until the cough subsides.

NET PRICES.

Pint bottles	per dozen, \$9.00
Gallon bottles	per gallon, 5.00
5-gallon bottles	per gallon, 4.60

Dose: Horses and cattle, 1 to 3 ounces;
dogs, 1 to 2 drachms.

LITERATURE ACCOMPANIES EACH PACKAGE.

Home Offices and Laboratories,
Detroit, Michigan.

Parke, Davis & Co.

